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Vol. VIII. NEW YORK, AUGUST 7, 1886. No. 6.

THE sixth reunion of "Old Timers," as the veteran telegraphists style themselves, will be held at Cleveland, O., on August 18. The military telegraphers assemble on the same day. The business meeting of the "Old Timers" will be held in the morning and that of the military society in the afternoon. On the 19th, the members of both organizations will make a joint excursion to Cottage Grove Lake, on the Valley Railway, transportation being furnished free by J. H. Wade, Esq., one of the brethren, and formerly President of the Western Union Telegraph Company. Returning to the city, a banquet takes place at 8 P. M. Mr. James D. Reid is President of the "Old Timers," Mr. Chas. S. Jones, Vice-President, and Mr. W. J. Dealy, Secretary and Treasurer. There is every promise that the occasion will be enjoyable and memorable.

PATERSON, N. J., has been greatly excited over the efforts of a blacksmith to prevent a neat and trim electric light pole going up in front of his shop. He has cut down three or four poles, and now threatens to blow up an iron one with dynamite. Considering that the electric light company is a servant of the city, and has numerous private customers, it seems to us that the blacksmith is, to say the least, very much of a dog in the manger. Probably the pole is far more ornamental to the street than his smithy, and it is also more than likely that the pole is in no respect an obstruction to his business. It appears that the matter has now gone to the courts. We hope the electric light company will win, and are glad to see that it has a considerable share of public sympathy in the matter.

EVERY ONE familiar with the rapid advance of electric lighting in America, knows that it has largely been due to the dauntless character of the men who became interested in it in the early stages of its development, and who have stood by it through all its phases of adversity, until it now has recognized place and deserved prominence in the list of the most successful and prosperous enterprises and industries in the country. Among the pioneers in the field of local electric lighting is the President of the National Electric Light Association, of whom we are enabled to-day to present a portrait and biographical sketch. The career described is in many respects typically American, but there are episodes in it suggestive of the man himself, as one who would have made a mark and have risen in any line of occupation.

THAT inventors in the field of the storage battery are by no means idle, is evidenced in our description of several new forms of recent origin. If we analyze the various attempts at improvement, we find that they relate chiefly to the method of so preparing the plates and the active material that the latter shall not become loosened and disintegrated by the chemical action which takes place. The addition of some inactive conducting material, such as carbon, to the substance upon the plates seems also to be looked upon favorably by some inventors. While work is principally confined to the lead oxide cell, we find now and then an attempt to use some other material, such as copper and zinc. Considering the relative potentials of the different materials employed and their storing capacity, the selection of material other than lead seems of doubtful utility. Still the work accomplished is by no means valueless, and contributes to general information on the subject.

THE adaptation of new devices to existing forms very often calls into play considerable skill and ingenuity; and indeed a good method of combining old forms with the new is sometimes the only means of introducing the latter successfully. Just at present such a case is presented in the change which is now rapidly being made in the method of propelling street cars, electricity being substituted for animal power. A simple method of attaching the electric motor to the car is evidently a valuable factor in the argument for the adoption of the new system. The method devised by Mr. Pendleton, and described in another column, is worthy of attention, as it embodies several novel features. While the employment of the worm and wheel is not new in this connection, the introduction of the coiled spring on the armature shaft would appear to overcome the necessity of maintaining the motor upon the truck, in the case of street cars where the axles are in close proximity. Thus, as is shown, it would only be necessary to bolt the motor to the bottom of the car, and to fix worm wheels upon the axles. The spring as here applied occupies the paradoxical position of constituting a rigid and a resilient connection, as occasion requires, preventing undue strains and at the same time transmitting power.

MR. E. A. HILL, in criticising a statement made by Mr. C. J. Kintner in his recent lecture on The History of the Electrical Art in the United States Patent Office, asks that gentleman, in our columns this week, to explain why *any* patent embodying the gravity principle was ever granted *at all* in the United States? In view of Mr. Hill's experience, he is certainly entitled to ask such a question, and while we consider Mr. Kintner fully able to answer this question so far as it relates to himself, it may be well to point out that patent office practice has undergone a great change in the last fifteen years for the better; and this is especially the case in the section devoted to electricity. At the time of Mr. Hill's application, electricity occupied the position of a sub class under the division of philosophical instruments, and we have no doubt that the examiner was conscientious so far as his knowledge went. We are free to say, however, that under the present conditions existing in the patent office, no such complaint as Mr. Hill's could be supported in relation to a patent issued within recent years. Since 1881, when the electricity was given a separate division in the patent office, largely increased facilities for search as regards the novelty of electrical inventions have been provided, and we agree fully with Mr. Kintner, that our patent system of to-day is the best in the world; and we believe that electrical patents issued to-day are honestly meant to give the inventor just what he is entitled to.

THE "underground" tidal wave has now reached Kansas City, where, at a recent meeting of the Common Council, a communication from the Mayor was read, in which he suggested the propriety of the passage of an ordinance requiring all telephone, telegraph and electric wires to be laid underground. The natural consequence of this has been to call forth a protest from those operating the existing lines, in which they pray for a hearing before final action shall be taken. In the meantime Mr. E. R. Weeks, in a forcible letter to the Kansas City *Journal*, draws attention to the objections which have been urged against placing the wires underground, and claims that in the light of past experience, a summary burying of the wires there now would be disastrous. He advises moderation and not unnaturally suggests that action be deferred until the results of the work, now to be commenced in New York, shall give data upon which to base reliable calculations. This caution of "waiting for New York" is, we find, rapidly gaining ground, and we therefore deem it of vital importance to the final solution of the underground problem for the entire country, that the work to be undertaken in this city be prosecuted in the most thorough manner. Failure here will mean delay indefinite for a score of other cities. There is little fear of the outcome, and if the contractors be held to the letter of the specifications, we can safely claim in advance that New York's proposed system will be a success. But New York can afford some things that would bankrupt other communities not so wealthy; and wholesale underground wiring may be one of them.

WE publish this week part of an interesting account of experiments carried out by Mr. W. E. Irish in connection with field telegraph practice, in which he shows that it may be possible to dispense with electrical batteries as such. His method consists in employing what he terms "potential plates" of such a composition that the true earth plate shall occupy a mean between the other two in the scale of potentials. By the use of the double current and polarized relay, he is then enabled to telegraph. This is certainly a point worthy of attention by our military authorities, as it may be employed to advantage, and the actual trials by Mr. Irish go to show its practicability. That gentleman even ventures so far as to assert his belief that it is possible to communicate electrically within a limited distance either in air or water, altogether independent of a metallic circuit; and to so communicate it is only necessary to support sheets of metal at one station in such a manner as to expose their largest surfaces to similar sheets of metal supported at about the same level at another station. In our last issue we published an account of Capt. Cardew's work and his method of employing the telephone in military telegraphy, and while Mr. Irish agrees with that gentleman in regard to the little necessity of insulating the line, he nevertheless looks upon the telephone as inadmissible in such application. He bases his reasons on the practice of the German army, and on the fact that the telephone leaves no permanent record of the message, while for purposes of thorough discipline and control the record is indispensable. The idea of communicating without a metallic circuit is, of course, not new.

As we predicted some time ago, the list of original inventors of the telephone is found to be far from complete, and as time passes, monuments to their memory will adorn every country of the globe. Last year Germany led off with a bust of Reis, unveiled at Gelnhausen, and she certainly deserves the credit of being the nation to take the initiative in the telephonic monument business. Italy, however, not content with her Volta, Galvani, and Pacinotti, has entered the lists for telephonic honors by quietly going to work and erecting a monument at Aosta to the "inventor of the telephone," Innocenzo Manzetti. As the date of the invention is only claimed to be as recent as 1864, and Reis dates several years ahead of that, this must be looked upon as a direct affront put upon Germany on the part of Italy. Can Germany afford to have her honor thus trampled upon? Will she rest under this imputation of subsequentness in the telephone business? In our opinion it is a clear *casus belli*—with the accent on the "bell"—and the secret mobilization of the German army, which is said to be going on, may not, as generally believed, be directed against France, but is probably intended for an early invasion of Italy. But if Germany should thus be exasperated at the infringment of her telephone rights, having only one original inventor to show, what must Uncle Sam say thereto with a score or more of original inventors on his hands for whom monuments will have to be provided as soon as they shall find it convenient to shuffle off this mortal coil? We earnestly commend this new insult to our citizens to the attention of our Secretary of State, and as soon as the Canadian fishery and Mexican border troubles are settled, we hope to see that Italian telephone monument outrage redressed.

REVIEWS OF NEW BOOKS.

POOR'S DIRECTORY OF RAILWAY OFFICIALS AND RAILWAY DIRECTORS. 1886. H. V. and H. W. Poor, New York. Pp. 387. Price, $2. (First year.)

This excellent directory is issued by the well-known publishers of *Poor's Manual of Railroads*, and is one of the best works of the kind we have seen. Not only is it replete with information, but the compilation has evidently been done with extreme care and great intelligence. As a comprehensive and accurate guide to the personnel of our steam and street railways it is simply indispensable. It contains, moreover, a list of the officials of all railways in Canada, Mexico, Central America, South America, West Indies, Great Britain and Ireland; of the officials of organizations auxiliary to railways, including telegraph companies; of officials of industrial establishments dependent on railways; of Exchange officials; of leading contractors; and of officials of railways not yet completed. The scope of the work is immense; yet the execution is adequate and highly satisfactory.

AMERICAN ELECTRICAL DIRECTORY FOR 1886. Compiled by Edward J. O'Beirne. Star Iron Tower Company, Fort Wayne, Ind. Pp. 495. Price $2.

This directory was issued for the first time in 1885. Even then, in spite of various shortcomings, its usefulness was at once apparent. Encouraged by the success and approval thus gained, Mr. O'Beirne has now prepared the directory for 1886, and the production is one giving an impressive idea of the importance of the electric lighting interests of the United States and Canada. It shows that the activity in electric lighting is not confined to any one part of the country, but manifests itself in every quarter. Oregon is as much interested as Ohio, and Minnesota as Maine. Some of the best electric lighting systems have gone West to grow up with the country, and others have found their reward in the more thickly settled East. A list is given of some forty manufacturers of electric light apparatus, the majority of whom are busily occupied turning out lamps and dynamos the year round.

The directory has as frontispiece a good lithographic portrait of Mr. J. Frank Morrison, the popular President of the National Electric Light Association. The portrait is accompanied by a biographical sketch. Both are reproduced in this week's issue of THE ELECTRICAL WORLD. A neat synopsis is given of the work done at the last two electric light conventions of New York and Baltimore. Then lists follow of the officers of electric light companies; contractors for electric lighting; manufacturers of electric lighting apparatus; isolated arc plants; isolated incandescent plants; electric light companies; gas companies, etc. Some very useful information is furnished in the shape of the prices of gas in various cities and the Philadelphia schedule for public lighting. Next come the detailed reports of electric light companies, by States, and then follow abstracts of electric light patents, from the "Illustrated Record" of THE ELECTRICAL WORLD. Altogether, the publication is a very useful one, and the information about all the companies is, we judge, complete—save, unfortunately, in one conspicuous instance, where the omission leads to the absence of the names of several plants from the record. In general get-up, the directory is, if we may form an opinion from the advance sheets, superior to that of last year, and worthy the subject and contents of the work.

The Phelps Telephone.

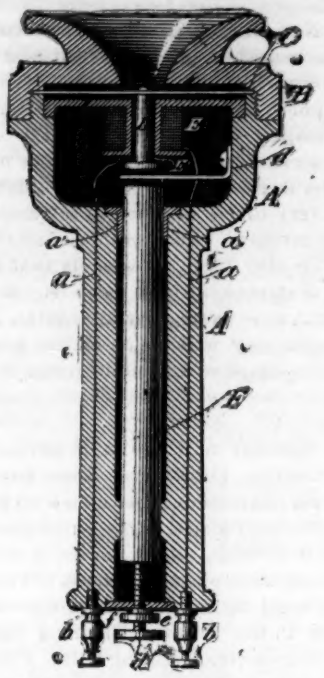
Among the latest designs in telephone construction, we note that shown in the accompanying engraving, which is said to make a very sensitive receiver. As will be seen, it consists of a hand-receiving case *A*, containing a diaphragm *C*, of any vibratory material (it is not necessarily capable of induction). This is held by its edge being clamped between the rim of the cup-shaped end *A'*, and an inner bearing of cap *B*. To the centre of the diaphragm is attached a small bar or core *D*, made of steel or soft iron, the latter being found preferable on account of its great sensibility when placed near a permanent magnet, and the rapidity with which its magnetism is varied by varying the distance between the iron and magnet. This bar or core is arranged to vibrate freely within an opening formed in the centre of a helix *E*.

One end of the bar is provided with a small flange, which end abuts closely to one end of a permanent bar magnet *F*. The object of the flanged end is to provide a larger magnetizing surface for the bar. A dividing or "anti-sticking" sheet *d* is secured within the cup-shaped end *A'* and projects between the ends of bar *D* and magnet *F*. This sheet is made of a metal or material upon which the permanent magnet has no effect, such as thin brass or copper. The object of sheet *d* is to prevent sticking of the ends of magnet *F* and core *D*, should they come together from any cause. The magnet *F* extends lengthwise through the handle of the case and is tightly fitted at the opposite end with an adjustment screw *d'*.

Between the thumb piece of screw *d'* and plate *f*, a check-nut *e* is loosely secured, by which the screw *d'* is held at any desired point. A washer *a' a'*, formed of rubber, is placed around magnet *F*, below the bottom of cup *A'*, to make the magnet easily adjusted.

In this instrument, which was designed and has been recently patented by Mr. A. M. Phelps, of Seabrook, Md., it will be seen that the current influences primarily a soft iron core, which then receives motion by its proximity to a permanent magnet.

Mr. Phelps has also employed the instrument as a transmitter. In this case the magnet *F* is placed perpendicular, and the diaphragm, spool and core *D* are made to work transversely.



THE PHELPS TELEPHONE.

A Novel Telephone Transmitter.

It goes almost without saying that much of the practical success in telephony depends upon the means employed for taking up the vibrations of the air. A non-elastic substance cannot be set in vibration as easily as an elastic one, and, again, an elastic substance acts the more perfectly according to the degree of adjustment which it receives. Thus, a violin string, if under no tension, cannot be made to give forth a sound by means of the bow. Acting upon this suggestion Mr. Grant Brambel, of Havana, N. Y., has designed and recently patented a form of telephone transmitter which is provided with special arrangements for adjusting the diaphragm and carbon points. The accompanying illustrations, Figs. 1 and 2, represent two sectional views of the transmitter taken at

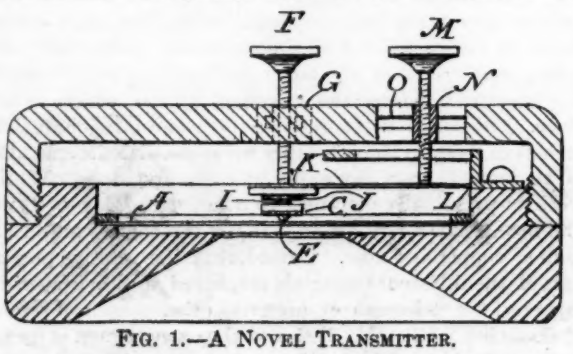


FIG. 1.—A NOVEL TRANSMITTER.

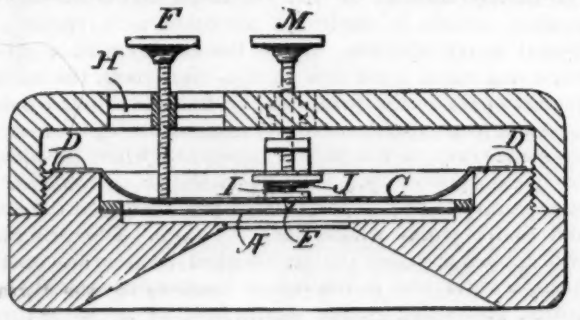


FIG. 2.—A NOVEL TRANSMITTER.

right angles to each other. Pressing upon the centre of the diaphragm is a conical point *E* attached to the centre of a metal spring *C*, one end of which is fixed and the other adjustable by the screw *F*. This spring also carries the carbon electrode *I*, and pressing against it is the other carbon electrode *J*. This latter is held by the spring *K*, which is also made adjustable in tension by the screw *M*.

By these means the tension of the electrodes can be made to great nicety, and varying adjustments for transmission over varying distances can be readily made.

Meeting of the Electrical Section of the American Institute.

At the meeting of this society, held on July 28, Dr. Vander Weyde in the chair announced that final action looking toward the official incorporation of the New York Electrical Society as a section of the Institute would take place this month.

In accordance with the rules of the Institute, the election of officers was then proceeded with, which resulted in the reëlection of Dr. Vander Weyde as President and in the election of Mr. Jos. Wetzler as secretary of the society, *vice* Mr. A. A. Knudson, who refused a renomination, much to the regret of the members. Three trustees were then balloted for, resulting in the election of Messrs. C. O. Mailloux, A. A. Knudson and John M. Pendleton.

The election concluded, Dr. Vander Weyde gave an interesting account of an experimental investigation of his to obtain ozone by the electrolysis of water, and he showed that, as might have been expected, the process was not an economical one, on account of the small quantity of ozone obtained in this way as compared with the power required to decompose the water.

Mr. C. O. Mailloux, commenting on the remarks of the president, described an apparatus designed by himself for the like purpose of generating ozone. This consisted of an induction coil having a primary of stout wire through which the current of a dynamo was passed. This current being continuously interrupted gave long sparks in the secondary coil. The terminals of the latter were connected to the alternate plates of a condenser consisting of tinfoil mounted upon glass sheets separated by an intervening air space. This condenser or ozonizer was placed in a glass compartment and air circulated through and between the glass sheets. The plates being continuously charged at a high potential by the secondary coil, a discharge was caused between the adjacent plates and thus ozonized the air in the well-known manner.

Mr. Mailloux stated that the ozone was obtained economically in this way, and that its purity was insured by the absence of all sparking. It seemed to be agreed generally that sparking, or a disruptive static discharge, generated impure ozone, and that to obtain good results the discharge must be a silent one, similar to the "brush discharge" of the static machine.

After some further remarks by Mr. Pendleton regarding his experience in the bleaching of oils by ozone, the meeting adjourned. The society's meetings will be suspended during the heated term, to enable the members to obtain more ozone after the usual manner.

Electric Lighting in Philadelphia.

"Philadelphia obtains electric lights cheaper than any other large city in the country," said Chief Walker, of the Electrical Department, last week to a *Record* reporter, in speaking of the apparent increase of 400 per cent. in the appropriations to his department during the past three years. "The average cost is less than 55 cents per night a lamp, and the truth is most of the companies that do lighting for the city lose money by it. Many of them make their figures very low for the privilege of being allowed to place their wires upon the city poles, and cover their loss in the charges to private customers. There are 352 lights paid for by the city, and they cost $10,000 less than they would in most other cities.

"As to the expenses of the department, the increase since 1884 is more apparent than real, and what there has been is for improvements rather than maintenance. The appropriation for 1884, when we did not have charge of the electric lighting, was $35,000 and in 1885, when it was transferred to us from the Police Department the appropriation was $84,467. Although I asked for $178,114 for 1887 I do not suppose I will get that much. This year we had $104,995. Of this $70,664 is for the maintenance of lights already up, and I have asked for $25,000 for new lights next year.

"The odd $70,000 is divided among a number of companies whose prices for lamps vary. Thus the Brush Company receives 52 cents a night for its lamps on Chestnut street, 58½ cents for those on Poplar street, and 55 cents for those on Lancaster avenue. The United States Company is paid 48 cents a night for its lamps on North Broad street, 59½ cents for those on Delaware avenue, and 62 cents for those on Federal street. The Northern Electric Light Company obtains only 39½ cents for four lights on Second street, above Callowhill, as the wires are strung on city property. It is paid 48 cents for its lamps on Girard avenue. A company in Frankford, whose lights only burn half the night, is paid 30 cents a lamp. In Germantown the price is 55 cents. The Thomson-Houston Company, whose lights are on Columbia avenue, is paid 48 cents a night. The average price for all the lamps is, as I said, less than 55 cents a night apiece.

"The cost of an electric light depends upon the number of lamps on a wire, the distance from the source of supply and other considerations. It is because of the greater distance that the United States Company charges 62 cents for a lamp on Federal street, while for those on Broad street it asks only 48 cents. The distribution of the lamps is, of course, a matter resting entirely with City Councils. It is only my duty to put them up where they are ordered.

"The operating expenses of the Electrical Department have increased very little, not over $4,000 since 1884, notwithstanding the great amount of extra work we have had to perform. The number of fire-alarm boxes has increased from 150 to about 500 within that time; the fitting up of the Police Patrol service has been put upon us; telephones have been placed in all the fire-engine houses and hospitals, and many improvements have been made. Certainly the expenses of the Electrical Department cannot be complained of as extravagant."

The Interdependence between the Dynamo and the Arc Lamp.

BY W. H. MILLER.

While sources of information on the principles of dynamo construction are numerous, there appears to be one condition necessary in a certain class of machines upon which little has been said. I refer to constant current dynamos, applied to arc lights in particular, but also to any class of work where a change of current produces a change of resistance.

It is well known that the resistance of the arc varies directly as its length and inversely as the current, or nearly so. Hence any change of current in a circuit of such lamps, due to a change of resistance, or from any other cause, while not in itself perhaps of sufficient magnitude to produce irregularities of the lights, will, by a change of resistance due to this change of current, produce a further change of current; and this reaction will go on until some counter-action is set up.

A theoretically perfect lamp, *i. e.*, one having no friction or inertia, would at once, by change of arc length, counteract this. But since such perfection of lamp cannot be attained, its action will not be prompt enough to check this increasing change of current until such change attains sufficient magnitude to set all lamps in action, thus producing the opposite condition and its reaction.

It is important that this tendency of current-change to react and multiply itself should be checked at its birth. No regulator will do this, for the same reason that the lamps will not. The better the regulator, or lamps, or both, the less need of some other means; but the necessity still exists; it is only a question of degree.

What is necessary is such a condition in the dynamo, that the E. M. F. will change inversely as the current changes, and nearly in the same ratio as the change of resistance necessary to produce this change of current. The more sluggish the lamps, the more nearly must this ratio be attained. That this condition in the dynamo is possible, is beyond dispute; but that it is also detrimental to economy or efficiency is also true.

Therefore it is desirable that the lamp be as nearly a theoretical one as will be consistent with a practical one. This will enable us to so proportion the dynamo, that when giving its normal current, the E. M. F. will be but little lower than the highest E. M. F. for that speed, and thus reduce the detrimental effect to a minimum.

The less sensitive the lamp in its action, the more nearly must the above ratio potential fall be attained and hence the further from the condition of highest efficiency.

The theory of large, slow-acting field magnets, however valuable in the class of machines designed for constant potential work, will not apply here. Nor will it do to jump to the other extreme, and assume that machines that are notably deficient in iron are more nearly right. It is a question of a correct proportioning of the parts; too little iron will be as bad as too much. The dimensions of armature core and of field magnets, the convolutions on same, quality of iron, and quality of iron of pole-pieces, are all factors which determine the extent of pole-pieces or the proportion of circumference they should surround.

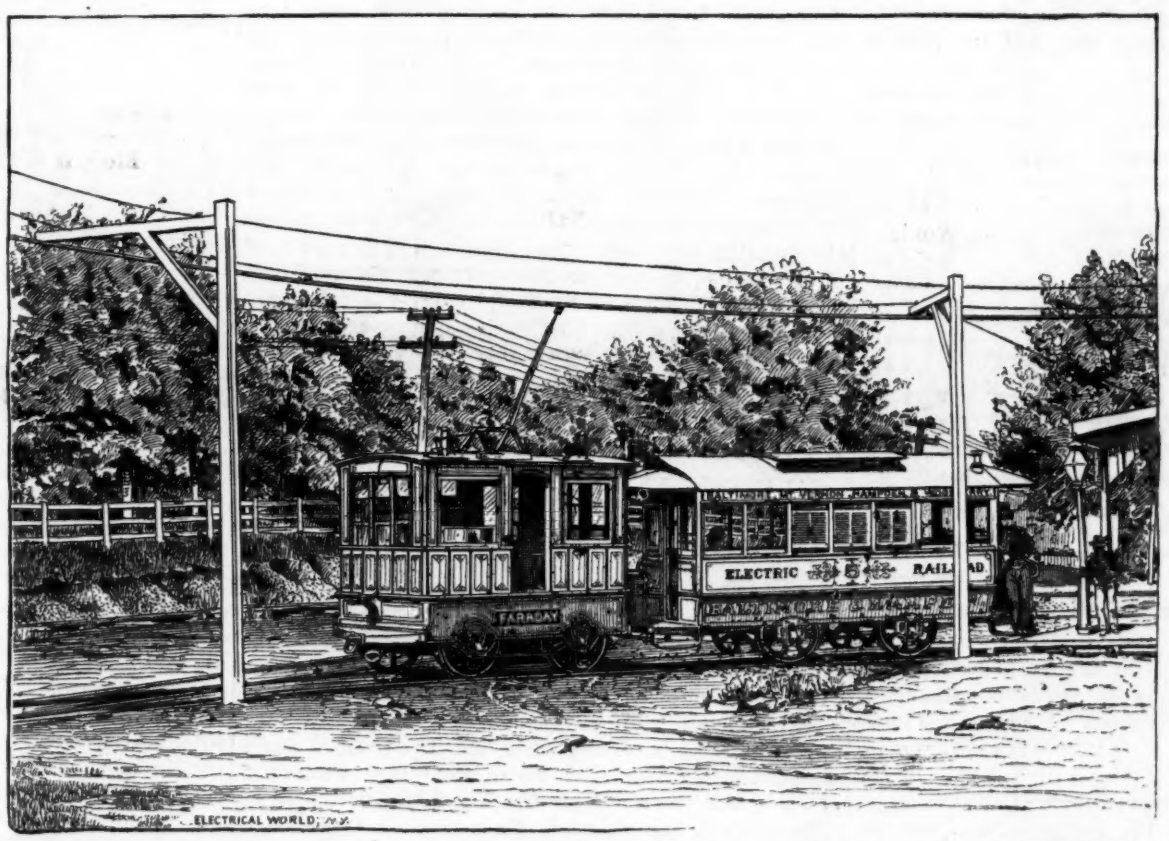
That all these conditions *can* be fulfilled, and that in comparatively few instances they *are* all fulfilled, is an apparent fact; and often good machines or good lamps are condemned, when the fault is not theirs, but rather a fault of the conditions under which they are placed. Taking a simple lamp circuit, if the potential consumed in maintaining current in the parts of the circuit other than the arc varies in a less ratio than the total potential varies, the movement imparted to the carbons by the change of current must exceed the rate of current change; and the slightest check in this motion produces an immediate rapid rise or fall of current—a very unstable condition for even a perfect lamp.

If this ratio is reversed, we have a stable condition rather than an unstable one, but we may also have a condition which requires the arc to actually close up on increase of current. If *one* lamp has these conditions to contend with, when more are added the problem is only more complicated.

Obeying the Law.—The buildings of the Potomska Mills corporation, New Bedford, Mass., are being wired to meet the requirements of the recent law. All the rooms will be connected with the engine rooms by means of electric bells.

Improvements on the Daft Electric Railway at Baltimore.

The engraving on this page represents the new overhead conductor attachment which has recently been added to the Daft motors on the Baltimore & Hampden Electric Railroad. As will be seen by reference to the cut, the contact mast is so attached as to be readily operated from the inside by the engineer; this was deemed necessary as the overhead conductors are at present only used at street crossings, thus leaving the track at such places free from the third rail and the raised guard, which were found to be objectionable. The manner of connecting the motors with the overhead conductor for the California railroads, now being equipped by the Daft Company, differs in some respects from that shown in the engraving, especially in the manner of completing the circuit to the motor; but as this will form the subject of a later engraving no further reference need now be made to it. As an instance of the continued successful working of the Baltimore road, it is worthy of note that on the three recent holidays, the 3d, 4th and 5th of July, upward of 7,000 passengers were carried, or over 8,400 more than by horses for the same time last year.



OVERHEAD CONDUCTOR ON THE DAFT ELECTRIC RAILWAY AT BALTIMORE.

A Criticism of the Patent-Office and One of its Examiners.

BY E. A. HILL.

When one attempts to teach history he should be careful to be truthful in his statements, that he may give "honor to whom honor is due." Mr. Examiner Kintner, in "History of the Electrical Art in the United States Patent-Office," an abstract of which appeared in THE ELECTRICAL WORLD, Nos. 20 and 21, last volume, makes this statement: "The gravity battery of Jean Armand Callaud deserves a passing mention, and was patented Oct. 17, 1871, * * * and is perhaps in more general use than all other batteries combined."

Now, while it is literally true that Callaud did obtain a patent Oct. 17, 1871, the implication that it was the "gravity battery" which was then patented is not true, for the "gravity principle" had been embodied in a patent long prior, and not first by Callaud, as the sequel will show. The "Hill battery," embodying the "gravity principle" solely, was invented in 1860 or 1861, and patented April 25, 1863, and had acquired a national reputation before this date of Oct. 17, which Mr. Kintner gives as the date of the birth of the gravity battery in the United States.*

As a matter of fact, Callaud obtained two United States patents, both of which covered only minor details of construction and could not have covered the gravity principle, for the reason that he had patented that in France in 1858, and had allowed it to be in public use in this country for more than two years prior to his application for patents.

More than two years prior to the earlier of the two Callaud patents, the writer applied for a patent on details of construction, and it issued March 12, 1867. He did this because he had learned that his first invention, though original with him, had been several times anticipated, and was not worth the paper it was printed on.

Finally, to correct the statement that the Callaud battery of 1871 "is perhaps more generally used than that of all other batteries combined," it should be stated that the gravity battery, as at present constructed, is a combination of the two patents of April and October, 1871, retaining the side-supporting of the zinc of the former and the folding radial wing of the copper of the latter.

To give "honor to whom honor is due," Mr. C. F. Varley, of England, was the *first* inventor of the gravity battery—he having obtained an English patent Dec. 5, 1854.-Callaud obtained one in France, May 19, 1858; Varley an improvement on the gravity, June 10, 1861; Callaud an English patent dated two days later. Having now corrected Mr. Kintner's *history* is it not in order to ask him to explain why *any* patent embodying the gravity principle was ever granted *at all* in the United States? In face of the fact that the patent law requires a thorough search to ascertain as to the priority of an applicant's invention, here are five foreign patents anticipating the Hill battery patent of 1863! Furthermore, the patentee, being advised thereto, surrendered the patent in order to strengthen his claims, and on March 12, 1867, a re-issue was granted which by law involved a *re-examination* as to novelty; so that again the examiners failed in their duty. The patent office exacts a liberal fee for such examination and re-examination, but what consideration does the applicant receive for his money in such a case as that just cited?

But this does not seem to ruffle the mind of Mr. Kintner, for he cites a similar case—that of Farmer—without thinking of, perhaps not caring for, the injustice done. Worse than obtaining his money without consideration may be, and no doubt are, the consequential damages to the deluded inventor. The possession of a patent for an invention which he believes is valuable excites hopes and an ambition to better his condition, perhaps to make his fortune, and he spends his money, if he has any, and his energy to introduce his invention, sooner or later to find that they are wasted. Has the inventor any remedy? Is an examiner ever held to account? Let this great defect in our patent administration be remedied.

* See the engraved head on the title page of *The Telegrapher*, New York, No. 1, Vol. VIII., Aug. 26, 1871, where it appears conspicuously contrasted with the Grove battery, illustrating electrical progress.

Prices of Copper.

Ingot copper is showing somewhat better, and, in fact, prices will be well sustained. It is said that better inquiry from buyers exists. The New York *Commercial Bulletin* now reports that ingot remains very steady at 10c., but other kinds are irregular and quoted at from 9¼c. down to 9c., according to brand. For Arizona pig 8¼c. is named. There has been little business the past few days. Cable advices note an improvement abroad, and it is significant in this connection that intimations are made here (New York) of a movement on the part of certain large mining companies calculated to check some of the unfavorable conditions that have been weighting the market.

The above named paper also says the consumption of copper in this country continues to steadily increase, and estimates from a trustworthy source are that the current year will show fully 15,000,000 pounds gain over 1885, while production from speculative mines has decreased 20 per cent. the past six months. It finds no reasonable doubt that the heavy increase of consumption in this country will be maintained, even with prices a little higher, for the usages to which the metal has been put are more likely to extend than to diminish. Within the past thirty days orders have been placed here for 2500 tons of matte, for future delivery, at eight cents per pound, and about 500,000 pounds have been taken at ten cents. There is, perhaps, not sufficient evidence to warrant expectations of material appreciation of values, but the facts certainly lead to the belief that the worst results of unfavorable conditions have been experienced, and that the statistical exhibits now are of interest rather as a retrospect than as a guide to the tendency of values in the future.

Lighting in Paris.

The Paris Gas Company, it is said, does not look upon electric light with that jealous feeling with which similar companies generally regard it. The monopoly which the company enjoys only refers to gas; the town may introduce electric light if it pleases. Without magnifying the importance of electricity as a luminant, the company states that it watches experiments at its employment with interest, and it offers to supply those who may be disposed to give it a trial with gas engines. It hopes by this means to get some recompense for the loss which the partial substitution of electricity for gas in special cases would entail.

Some Recent Improvements in Storage Batteries.

One of the best indications of activity in any line of work is that exhibited by the records of the patent office and its issuance of patents. Thus we may take it for granted, when a number of patents are issued covering a certain field, that active experiment and investigation are going on. This is the case at present with the storage battery, upon which several patents of interest have recently been issued.

Among these one issued to Stephen Farbaky and Stefen Schenek, of Schemnitz, Austria, merits a more detailed description, as they claim that their cell embodies qualities which not only insure it long life and efficiency, but cheap manufacture.

In this cell, which is shown in section in Figs. 1 and 2, the inventors make the plates of the positive pole in general thicker than those of the negative pole, in order to resist the corroding action of the ozonized oxygen and the expansion of the packing material. The thickness of the positive plates is about ten or twelve millimetres and that of the negative about six to eight millimetres.

The packing material of the negative plates consists of 95 parts, by weight, of pulverized litharge (free of copper), and of 5 parts, by weight, of granulated pumice stone, the diameter of the grains being about 1 to 1½ millimetres. The pumice stone is added for the purpose of loosening the mass and for obtaining greater porosity. These two materials are intimately mixed with diluted sulphuric acid.

The resulting mass (the active material) is then brought into the interstices of the lattice frame of the plates and distributed so as to project about 3 or 4 millimetres over the frames. It is then fixed into the frame by beating with a flat brass bar until a visible sweating of the material is produced; the remaining parts above the plates are then cut away or scraped off. The other side of the frame is then treated in the same way, and the plate is then dried.

The active material of the positive pole plates consists of 95 parts, by weight, of litharge; 95 parts, by weight, of

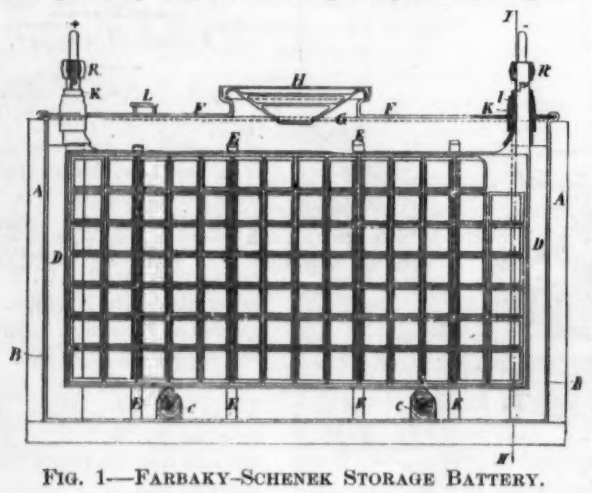


FIG. 1.—FARBAKY-SCHENEK STORAGE BATTERY.

minium, and ten parts, by weight, of coke, in the form of a powder of about one to one and one-half millimetres diameter. These materials are intimately mixed in a dry state, and packed into the positive plate frames in a similar manner as heretofore described for the negative plates. By the addition of the pulverized coke two essential advantages are attained, according to the inventors, viz., first the mass, which in itself is not conductive, becomes thoroughly conductive; and secondly, in consequence of its porosity the coke causes a loosening of the entire mass, and absorbs easily the sulphuric acid. The plates thus prepared are dried in free air or otherwise during two to three days.

In order to obtain a higher degree of hardness and solidity of the plates, and principally to prevent the softening and falling out of the active materials from the plates, the latter are submitted, after drying, to the following treatment: A bath of sulphuric acid of 1.85 Baumé, diluted with seventy-five per cent. water, in a chest or trough lined with lead, is prepared. In this bath the plate is rapidly dipped, then quickly taken out and left to drain. After twenty-four hours, the plate is again dipped into and kept in the above bath until the produced effervescence ceases almost entirely. In case the bath should become turbid, like milk, around the plates, the latter must immediately be taken out and left to dry. After a further twenty-four hours, the plates are dipped into the bath for a third time, and left therein without danger for ten or twelve hours. By this treatment the upper layer on both sides of the plates becomes partially converted into sulphate of lead, which stiffens like cement, and prevents the material in the interior of the plates from falling out. Simultaneously the minium of the positive plates is converted partially into peroxide of lead, whereby the plates receive a chocolate-like appearance. The plates are then ready for being placed in the accumulator.

The inventors deem it advisable to insulate the plates by means of paper (treated with nitric acid), in order to prevent a short circuit in case particles of the active material should fall out from the plates during transportation.

In order to prevent as much as possible vaporization of the diluted sulphuric acid, the accumulator is covered with a thick sheet of lead *F*. In the centre of this cover *F* there is a circular opening *G*, in which is fixed a tube of lead of three to four centimetres' length. This tube is closed with a conical-shaped cover *H* of lead. The opening *G* serves only for the introduction of the diluted sulphuric acid. It is a circular opening in the centre of the lead cover *F*, bounded by a tube of lead and closed with a conical-shaped cover *H*, to allow the dropping of the acid splashed up during the charging. The covers have round

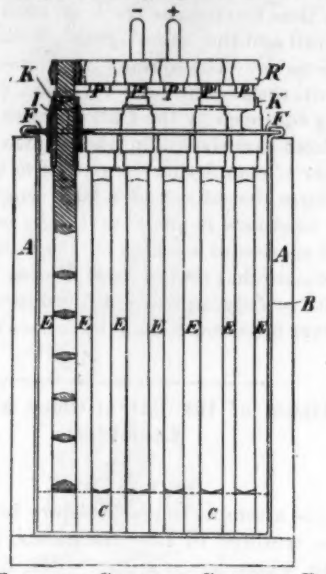


FIG. 2.—FARBAKY-SCHENEK STORAGE BATTERY.

holes on both sides corresponding to the number of the positive and negative pole bars which have to pass through these holes. In the latter are inserted short tubes *I*, of lead, projecting about one centimetre in length above and below. The pole bars are coated with tubes *K* of india-rubber, in order to insulate the same from the plate of the cover. At one corner of the plate of the cover is soldered a tube *L* of lead, (of two centimetres' length) through which the acid may be drawn off from the box by means of a siphon. After the cover has been placed and connected with the lead lining *B* of the box the positive and negative pole bars *PP'* are connected by bars of lead *R*, on the ends of which are soldered pieces of tinned copper wire, which serve as poles and carry the pole-jaws. The accumulator is then filled with sulphuric acid of 1.85 specific gravity, diluted with seventy per cent. water, and may be at once charged.

In the storage battery devised by A. L. de Virloy, E. Commelin and G. Bailhache, of Paris, France, the electrodes consist of copper and carbon, and the exciting liquid is a zincate of potash or soda, with sulphate of potash or soda.

The inventors make up their cells in three compartments, as shown in Fig. 3. In the centre of each is placed a thin carbon plate, covered with a layer of a mixture of metallurgic or gas-coke or retort-coke pulverized, or plumbago with hydrate of oxide of copper or anhydrous oxide of copper or other metallic oxide which is insoluble in a solution of potash or soda. The layer is protected by a hempen cloth, and this constitutes the positive pole. Surrounding each carbon plate are two copper plates wrapped with copper wire gauze and folded in the form of a thin box, the whole constituting the negative pole.

The exciting liquid consists of a concentrated solution of

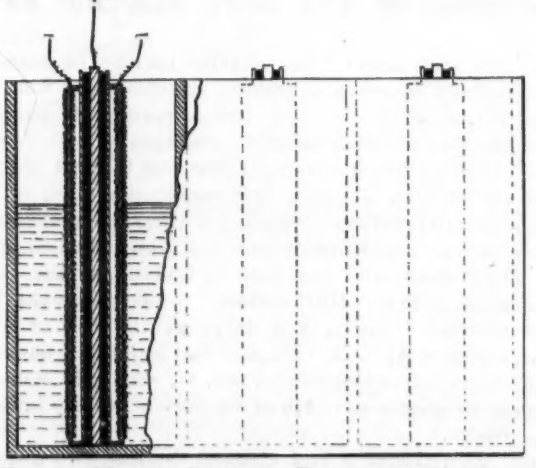


FIG. 3.—VIRLOY-COMMELIN-BAILHACHE STORAGE BATTERY.

zincate of potash, or soda containing sulphate of soda or potash, with an excess of potash or soda.

During the charging of this cell no effect is produced on the positive pole unless it is that the oxide employed may be susceptible of peroxidation; but on the negative metallic zinc resulting from the decomposition of alkaline zincate is deposited. This zinc in a spongy or porous state will be deposited on the plate or gauze of copper, and this will go on until the solution is exhausted.

During the discharge of the cell the potash or the soda set at liberty eats into the zinc and re-forms alkaline zincate. The hydrogen resulting from this reaction acts upon the hydrate of oxide of copper or other metal, and reduces it to a diminished degree of oxidation, or even to a metallic state, as is the case with copper, so that if care be taken to employ a quantity of oxide equivalent to the zinc contained in the solution of the alkaline zincate the accumulator will be completely depolarized.

Still another form of storage battery is that of Sylvanus L. Trippe, of Denver, Col., whose improvement relates principally to the composition of the electrodes. The plate, which is shown in Fig. 4, is made by preparing a mixture of metals, each one hundred parts of which is composed of sixty-five parts, by weight, of metallic lead, thirty parts of metallic zinc, and five parts of metallic silver. The office of the silver is to give strength to the plate and prevent the same from crumbling when used in the battery, though by its high conductivity it also serves to assist in rapid discharge of the stored electric energy, as well as to strengthen the plate.

A coil of wire is inserted in the mold around and through which the melted mixture hardens in cooling. The wire is so coiled as to extend throughout the body of the plate, and is connected with the binding-screw cast in the plate.

To prepare the plate for use in a storage battery, it is placed in a strong solution of sulphuric acid in an electric circuit, when, in a short time, it becomes sufficiently porous for use. The zinc in the alloy, when acted on by the acid, is decomposed, and thereby minute perforations are produced in the plate. When the zinc in the electrodes has been decomposed by the acid, and the lead filled with fine perforations, the greatest attainable surface will be exposed, while the silver in the alloy and the copper wire will keep the plate from crumbling, and insure a rapid discharge of the stored energy.

Chromic Acid for Batteries.

The chromic acid contained in bichromates of soda and potash is combined with soda or potash, as the case may

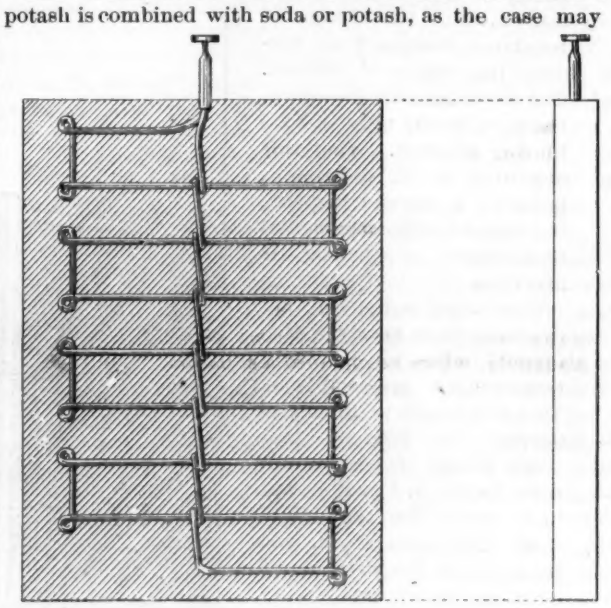


FIG. 4.—TRIPPE STORAGE BATTERY.

be, and requires, before it can be rendered available, to be set free by the profuse use of sulphuric acid; or, if the sulphuric or other acid be used stintedly, only a part of the chromic acid is set free and is available. With this defect in view, to be remedied, Messrs. Sullivan & Co., Limited, of the British Alkali Works, Widnes, England, are now introducing to the notice of electricians on this side their chromic acid, which is being largely used in England as a depolarizer in batteries of all classes used for driving motors, electric lights, etc., and also for telegraphic purposes, in place of the bichromates of soda and potash heretofore used.

The chromic acid is free from soda or potash, and being entirely a free acid can be completely utilized, while, being a solid, it is quite as easy to handle.

As is well known, the solutions from bichromate batteries are all more or less crystallizable, and often batteries charged with them cease work from crystallization of soda or potash chrome alum on the plates.

The sulphate of chromium resulting from the deoxidation of the free acid, however, is extremely soluble, and it is said does not crystallize even if left for months.

Solutions of any desired strength can be made with this acid from those containing 60 per cent. of the chromic acid to those containing 6 per cent., and thus the great range of concentration at the disposal of the consumer allows the solution to be adapted to any kind of work in hand.

Speaking generally, strong solutions, with the necessary amount of sulphuric acid present, are used in two fluid cells, while more dilute solutions are used in single fluid cells and in telegraphic cells. The fluids for single fluid and telegraphic cells are prepared according to the formula:

$$2Cr\,O_3 + 6H_2\,SO_4 = Cr_2\,3(SO_4) + 3H_2\,SO_4 + O_3 + 3H\,O;$$

i. e., for every 1 oz. of chromic acid present there must be 3 oz. by weight of sulphuric acid, one-half of which is required by the zinc to form sulphate of zinc.

The depolarizing fluid for two fluid cells is prepared according to the formula:

$$2Cr\,O_3 + 3H_2\,SO_4 = Cr_2\,3(SO_4) + 3H_2\,O + O_3\;;$$

i. e., for every 1 oz. of chromic acid, 1½ oz. of sulphuric acid is used, since in two fluid cells the acid for the solution of the zinc is separately provided.

These are the proportions, or thereabouts, in which chromic and sulphuric acids should be present in the solution in their relation the one to the other, sulphuric acid, however, rather than chromic being in excess.

With regard to the actual state of concentration of the solutions to be observed in use, this may be varied according to circumstances.

For single fluid cells a solution containing 1 lb. per gallon of chromic acid, with the necessary sulphuric acid (3 lbs.), is the strongest solution used, while it can be made weaker to any desired extent.

For two-fluid cells to work lamps or motors, etc., the strongest solution used contains 3 lbs. of pure chromic acid and 4½ lbs. of sulphuric acid per gallon. This solution can, of course, be made weaker if desired, or mixed with nitric acid, which rather increases its efficiency. For telegraphic batteries, a solution containing about the same strength as the strongest single fluid liquid is used.

James Frank Morrison.*

James Frank Morrison was born at St. John, New Brunswick, April 18, 1841. His parents on both sides were natives of the north of Ireland; his father of the town of Derry, and his mother of Moville, County Donegal. Their ancestors were of Scottish origin. On the maternal side, Highlanders; on the paternal, Lowlanders. They thus united the two principal streams in the blood of the sturdy Scotch race with that of the north of Ireland, forming that distinctive type of the human family known as the Scotch-Irish, whose sterling virtues, genius and enterprise are pre-eminently conspicuous on the pages of history.

The parents of the subject of our sketch came to America in 1823, landing at Boston, where they resided until 1838. Two children were born to them here, and some time during the last-named year they removed to St. John, N. B., where, as already stated, James Frank was born. He lived at home until his fifteenth year, and during that time received at the hands of a competent private tutor a good rudimental education. Thus equipped, in 1855 he left his home and went to Boston, the former abode of his family, where he obtained a situation in a commercial house. During this time he studied the art of telegraphy (then almost in its infancy). In 1862 he came to Baltimore, and shortly thereafter entered the telegraph service of the Baltimore & Ohio Railroad Company, in which he remained until 1868. He had constantly kept his attention fixed upon electrical matters, and soon became a recognized expert in all branches of the business. Having been appointed superintendent of the old fire-alarm system then in existence in that city, he reorganized the entire department. The fire and police alarm system of Baltimore, in its present high state of efficiency, is due mainly to his skill and intelligence.

About that time he was elected clerk of the Maryland State Senate. He was subsequently appointed a fire commissioner by Mayor Latrobe, and, while serving in that capacity, was appointed by the same mayor to the wardenship of the city jail, a position which he still continues to hold, greatly to the advantage of the institution under his charge. The condition and discipline of the jail have indeed undergone a complete revolution during his management. Its condition has received the highest commendation from the general public, and also from those engaged in special prison work. An English inspector of prisons, who, in the course of his professional duty, recently visited this country, pronounced the Baltimore city jail the model institution of its kind in the United States.

In 1878 Mr. Morrison constructed the first long line telephone in the world, the length being 210 miles, the distance along the course of the Chesapeake & Ohio Canal from Georgetown to Cumberland.

Mr. Morrison is president of the Crescent Club of Baltimore, of which he was one of the original organizers, an association which now numbers some 1,500 members.

He was the first to introduce and successfully carry into operation the lighting of the streets of the City of Baltimore by electricity, having about six years ago introduced the Brush system and organized the existing Brush Electric Light Company. He also erected the Morrison Electrical Works, and established the Southern Electric Co.

Mr. Morrison married a daughter of the late Captain John Sifford, a leading and wealthy citizen of Frederick, Md. Mrs. Morrison is a sister of the wife of Aubrey Pearre, a stock director in the Baltimore & Ohio railroad, and head of the prominent importing and jobbing dry goods house of Pearre Bros. & Co., of Baltimore.

In person, Mr. Morrison is of stalwart and compact frame, well knitted and indicative of great capacity for exertion and endurance. He is quick and decisive in his manner, rapid in combination and grasp of details, magnetic in his influence over men, and seems to have become mentally imbued with the effects of the subtle element which he has for so many years been accustomed to manipulate. His organizing and administrative ability is, in fact, an intuition. His quick discernment of character, of possible combinations and results, his keen penetration and knowledge of men, always enabling him to make choice of the proper agents for the accomplishment of the end in view, constitute the basis of his remarkable administrative powers. In every position, of whatever nature, he has occupied he has at once introduced the best order and system, and, though at times he has appeared to timid persons careless of expenditure, the results in the end exhibited a wise economy.

His mind is well stored with general information; nor has he neglected to cultivate an acquaintance with books and literature, he having now in his possession one of the best private libraries in Baltimore.

The student of physiognomy may easily read much of the mind's construction in the features of the portrait at the head of this article, as well as of the strong physical powers which characterize the original.

As a recognition of his services as a trained and thorough electrician, the National Electric Light Association of the United States at their first convention, which met at Chicago in February, 1885, unanimously elected him President of that organization, an honor which they have not since permitted him to decline.

JAMES FRANK MORRISON.

To his ceaseless energy and untiring efforts more than from any other source is without doubt due the success of that important and prosperous association.

* American Electrical Directory, 1886-7.

The Working of Uninsulated Lines by Means of Potential Plates and Military Telegraphs.

BY W. E. IRISH.

Great interest appears suddenly to have been taken by the responsible authorities and others, in almost every civilized country, in military telegraphs. We learn that while Gen. Molineux, of the National Guard, was exercising his men in New York Bay in flag signaling, Captain Cardew, of the Royal Engineers, was reading a very interesting paper on the subject of military telegraphs before the Society of Telegraph Engineers in London.* The subject is also receiving considerable attention in France, Germany, Austria and Japan. Hence a short account of an equipment and the method of working it may not be entirely uninteresting.

The telegraph is to an army in the field an essential adjunct, being, undoubtedly, one of the most valuable auxiliaries a general in command as well as the government and people of the country he represents, could possibly possess. No one can question the remarks made by Major Durnford at a recent meeting, that the country employing the most efficient telegraph equipment and appliances, of two at war, will in future hold the trump card. Yet it is only a few years ago when many of the best and most able generals throughout the world belittled the value of the telegraph in the field, and were very skeptical of its advantages. To-day they know its value from experience, and would be as likely to go campaigning in the future without it as without ammunition for their guns.

* ELECTRICAL WORLD, July 31, 1886.

I do not agree with the editorial remarks in a recent issue of THE ELECTRICAL WORLD on General Molineux's drill. Although a constant reader of that most valuable and, to all interested in electrical matters, indispensable journal, this is to my recollection the only occasion when our views have differed. Visual and acoustic signaling are undoubtedly of great value in the field, as repeatedly proved in the Abyssinian, Afghan, Ashantee, Egyptian and other British campaigns of recent date, in all of which visual signaling was more or less extensively employed, and when necessary also acoustic apparatus; but whichever system was used, so far as I have been able to ascertain, they gave very satisfactory results and proved of great service. I consider that Gen. Molineux, in training his men in flag signaling, is doing the next best thing to the all-important one of teaching them the science of military electric telegraphy. The appliances, apparatus and systems employed by the various countries for communciating in the field are legion. In this art the British are second to none. They have a corps of mounted signalers as well as a well-trained and well-equipped field telegraph corps.

The signalers, who are sent out as vedettes and scouts in groups of three, transmit information to other groups and to the electric telegraph system, for which they act as feeders, and as such render most valuable service. Both men and horses are specially selected for this service, and are thoroughly well trained in their duties. One of the three men acts as flagman, one as reader and the other as writer. They select elevated points from which they signal, under cover from the enemy's view, to their comrades in the rear, who either repeat each message as received to a third party, or hand it to a telegrapher for electric transmission; or one of their number is instructed to deliver it. The signaling by day is principally carried on by means of flags, shutters, collapsing cones, and heliographs, and by night with electric, lime and oil lamps, rockets, horns, and captive balloons. Code books are sometimes used, but the simple Morse code is decidely better in every respect. The code book consists generally of sentences prefixed by numerals or letters. The numbers or letters prefixed to a sentence forming the whole or part of a message to be transmitted are sent in groups, and are repeated back by the receivers. This repeating takes time, but is a necessary precaution against mistakes. To cipher the messages, the numbers sent are read ten, fifteen or twenty numbers on either side of the numbers representing the correct message. For instance, 3,470—*Enemy advancing on right*, might be sent as 3,485—*Supplies arrived*. So that the enemy, if in possession of the numbers sent and a code book, unless in possession also of the secret as to how many numbers to refer forward or back for the true message, would not be able to understand it. It can easily be seen that any mistake made in any one figure of the group transmitted may cause a message to be delivered having a reverse meaning to that which it was intended to convey. Mistakes can easily be made when employing the numeral signs, as five dots may often be read as four, or four dots sent may be read as three, or five. The Morse system is not so liable to mistakes, as several signs must be misunderstood to cause one figure to be read as another. It is by far the best, simplest, quickest and most reliable system, and should alone be employed.

(TO BE CONTINUED.)

New England Telephone Company.

The New England Telephone Company will pay a dividend of 75 cents August 16 to stockholders of record July 31. The quarterly statement for the three months ending June 30 shows as follows:

	1886.	1885.	Difference.
Gross	$228,043	$233,336	Dec. $5,293
Expenses	168,858	165,034	Inc. 3,824
Net	$59,184	$68,301	Dec. $9,117
Construction	1,170	18,899	Dec. 17,729
Surplus	$58,014	$49,402	Inc. $8,612
For the half-year:			
Gross	$448,787	$462,959	Dec. $14,172
Expenses	325,696	324,369	Inc. 1,327
Net	$123,090	$138,590	Dec $15,500
Construction	2,069	46,352	Dec. 44,283
Surplus	$121,021	$92,237	Inc. $28,784

Reduced construction expenses have a favorable effect upon the surplus, but independent of this the company is doing well. Subscribers are increasing since the Legislature adjourned, and the outlook is favorable. There has been no occasion to sell any of the preferred stock. The books show a balance to the good above the dividend, but since any surplus above 3½ per cent. per year would go to the Bell company, it is doubtful if more than 3½ will be declared this year. The dividend declared is the second under the February agreement, and makes $1.50 per share. The remaining dividends will be $2 combined, divisible as the directors may elect.

The Application of Electricity to the Development of Marksmanship.*

BY CAPT. O. E. MICHAELIS, U. S. A.

And now I come to the application of electricity to the measurement of initial velocities.

Who first suggested this application? Most writers appear to agree that the honor belongs to Wheatstone, and assign 1840 as the date; still, Germany claims it for Siemens; Russia and France for Konstantinoff and Breguet, a scientific copartnership; and Belgium for Navez.

But we have strong ground for considering our own revered Henry as the deviser of the first complete electro-ballistic chronograph, or instrument for recording by electrical agency the time occupied by a bullet in its passage between two points, a given distance apart. I will briefly tell you what was proposed in Europe and America, and let you decide the question of priority of invention. Prof. Charles Wheatstone first measured the velocity of electricity in 1834, using for the purpose a timed revolving mirror. In continuation of these experiments, with the intention of observing and registering minute intervals of time, he undoubtedly projected a "chronoscope," operated by the automatic agency of electro-magnets. He had in view the determination of the time of falling bodies, the observation of the duration of gunpowder explosions, and other delicate investigations. This ingenious device was adopted for the measurement of initial velocities, but the precise time at which this novel application was suggested it is difficult to determine. He first *published* an account of this application, induced by circumstances which I will mention directly, in 1845. We know, however, that in 1842 Colonel Konstantinoff, an able Russian artillery officer, visited England, and while there Wheatstone showed and explained his original chronoscope to him, with inferable consequences that you will see presently. Virtually, Wheatstone used a clock, whose train was released by the falling out of gear of the armature of an electro-magnet consequent upon the rupture of a galvanic circuit, and again arrested by the throwing into gear of the same armature upon the re-establishment of the circuit, as shown in Figs. 1 and 2.

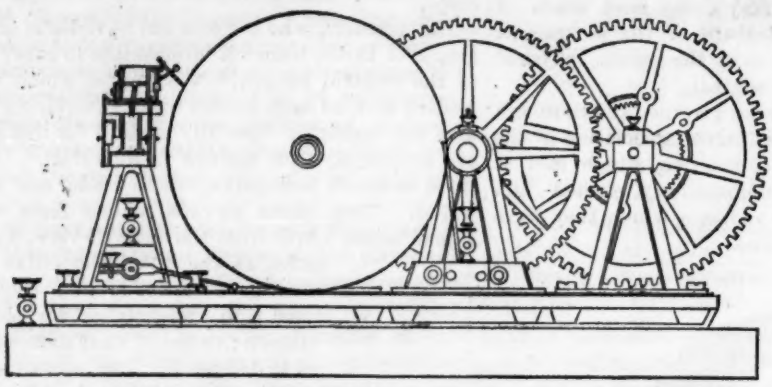


FIG. 3.—KONSTANTINOFF-BREGUET CHRONOSCOPE.

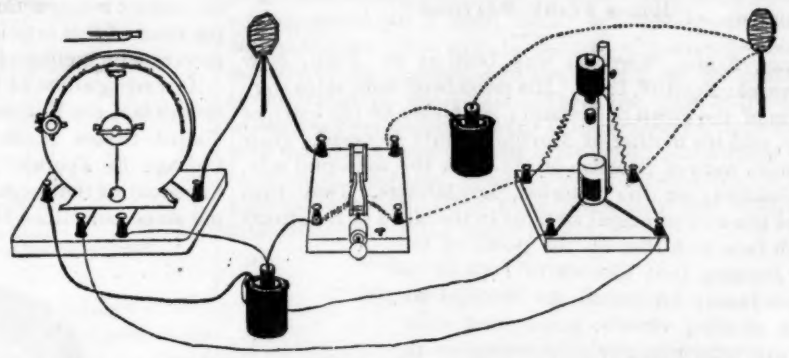


FIG. 4.—NAVEZ PENDULUM WITH ATTACHMENTS.

You can readily see that the inertia of the train, variations in residual magnetism, and time required for re-establishing the circuit were sources of error. In the published "Proceedings of the American Philosophical Society of May 30, 1843," is an abstract of Professor Henry's paper, "On a New Method of Determining the Velocity of Projectiles." He used a revolving cylinder, Mattei's apparatus revived, actuated by a clock train so as to make ten turns per second; the surface was divided into 100 equal parts, each part therefore corresponding to the $\frac{1}{1000}$ of a second. Two galvanometers were established close to the cylinder, at opposite ends of a diameter, whose needles were furnished at one end with a pin for making dots on the cylinder. Each galvanometer was in a circuit passing respectively through two screens, a known distance apart, placed in the projectile's path. During the continuance of the currents, the galvanometer needles were deflected against a steady pin, but upon their rupture the marking ends of the needles were thrown against the cylinder by fine spiral springs coiled about the centre pins of the needles, and thus "dotting" the cylinder. Of course, the position of the dots gave the time of the ball's passage between the screens. I cannot help admiring the completeness of detail of Henry's chronograph, for he provided against almost every instrumental error. His "steady pins" were movable, by which the excursion of the needles could be increased or diminished, and his spiral springs were governed just as those of our watches. He recognized fully the necessity of the needles describing their small arcs, which need not exceed the one-twentieth of an inch, in equal times. To insure this, he brought his two circuits together by a common wire, which dipped into a cup of mercury; this he lifted out while the cylinder was rotating, and adjusted the needles, until the dots were exactly at opposite ends of the diameter. In order that the pins might not obliterate the dots in describing their circles, Henry recommends that the cylinder be also given a slow translating motion. In a subsequent communication to the *Recorder*, Professor Henry proposed to substitute induction coils for the galvanometers, whose sparks, upon rupture of the primary circuits, would perforate the graduated paper covering of the cylinder, and added: "In the same way the terminal points of wires from a number of different pairs of screens may be made to impress their marks on the surface of the same cylinder, and the velocity of the ball at the different points of its path may in this way be determined by a single experiment." Prof. Henry was, undoubtedly, the first to suggest the application of the induction coil, thus eliminating the errors due to remaining magnetism, and he was the first to suggest an apparatus capable of recording continuing observations on one trajectory. Colonel Konstantinoff, evidently impressed with the feasibility of applying Wheatstone's device to military purposes, at once gave his attention to its modification, and in conjunction with the ingenious Breguet, began at Paris, in June, 1843, the construction of an apparatus that should record many time observations within a single trajectory. This was completed in May, 1884, and it was described before the French Academy, Jan. 20, 1845. In this instrument, Fig. 3, the records were made upon a revolving cylinder, timed by a Breguet recorder, by styles operated by electro-magnets at the moment of successive ruptures of the circuits. Wheatstone's remonstrance, together with a description of his own apparatus, was presented to the Academy, four months later, May 26, 1845. Konstantinoff's device of 1844 resembled much more closely Henry's, described and published in 1843, than Wheatstone's, described and published in 1845.

The main difference between the Henry and the Paris apparatus lay in the substitution of electro-magnets for galvanometers.

Certainly Henry's suggested use of the secondary current was far more delicate than either, as it avoided the inertia of the needle or the armature, and is the exact method now followed in our most delicate instruments. It seems strange that with the very best form of electro-ballistic chronograph first described by one of our own people, we have permitted others to carry off all the honor of practically originating, applying and developing, to such an extent indeed, that with one exception—General Benêt's "Electro-ballistic Machines"—Henry's name is not even mentioned by the authorities. Very likely the Mexican war, the discovery of gold in California, Indian hostilities, and the slavery discussion, combined to prevent the evolution of an earlier Edison, who would have made the world ring with the merits of the invention.*

Captain Navez, of Belgium, claims to have had, in 1841, the idea of suspending the moving screen of Colonel Dobooz by an electro-magnet, but, if experiments were made, they amounted to nothing, and certainly no account was ever published. However, an intense impetus was given to the study and development of this branch of applied electrical science, and the next twenty years witnessed the introduction of numberless methods for attaining the desired result in England, Belgium, France, Germany, Switzerland and America. First, Hipp made an important improvement in the Wheatstone apparatus; he so constructed his clock that the train was in continuous movement, the electro-magnets merely throwing a small pinion governing the hands in and out of gear. This instrument you see before you—it is a good representative of the electrical chronoscope, or time-*shower*. In 1848, Captain Navez, probably well-read in the works of Robins and Hutton, devised an electro-ballistic pendulum, which appears soon to have been considered as the best and most practical means for determining initial velocities. Changed and improved, it became in 1858 the standard velocimeter in all military countries, and is the instrument so highly eulogized by General Gibbon. It maintained its supremacy well into the sixties, but is now relegated to museums, from one of which I have exhumed the specimen before you, Fig. 4. We have just seen that the swing of a pendulum is a simple and constant time measure at any assumed place. Now, suppose we start a pendulum swinging at the precise instant when a projectile passed a given point, and stop it again at the precise instant when the projectile passed another given point, then knowing the extent of the swing, we would know the time occupied by the ball in passing between the two points, and consequently its velocity, which is the distance divided by the time. This is just what Captain Navez did. He suspended a pendulum by means of an electro-magnet in circuit with one target. The bullet breaks this and the pendulum falls. On the breaking of a second target, the pendulum is stopped by means of another electro-magnet, then thrown into circuit. The pendulum swings in front of a graduated arc, and as it would require a large magnet, and induce severe strains, to attempt to stop it suddenly, a light index needle swings by friction with it, and this is arrested at the proper moment, while the pendulum is free to continue its movement. This would be very simple if the bullet completed a circuit in passing the second target, but it breaks one, and so a rather complicated piece of mechanism, called a conjunctor, also furnished with an electro-magnet, had to be introduced in order to establish the index-needle stopping current, when the bullet broke the target current. We would use an ordinary telegraph relay for this purpose. Now, the electro-magnets and the conjunctor require time for their operation, small in itself but large in proportion to the whole time to be observed, and this instrumental time has nothing whatever to do with the duration of the bullet's flight between the two targets. But it is included in the

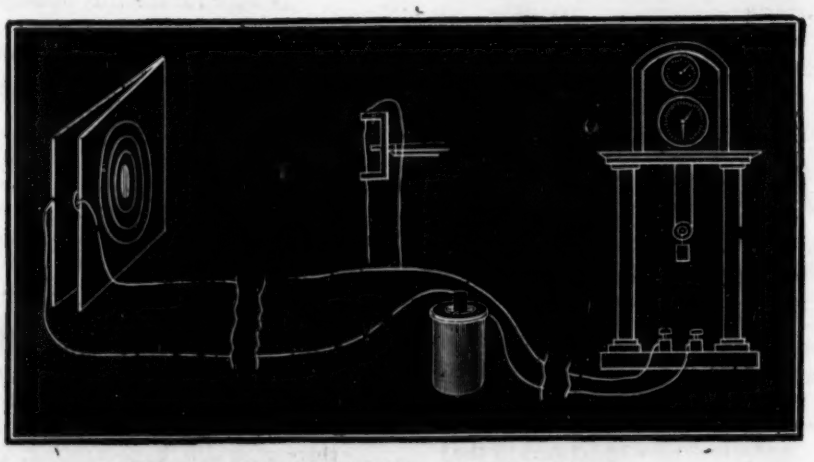


FIG. 1.—WHEATSTONE CHRONOSCOPE.

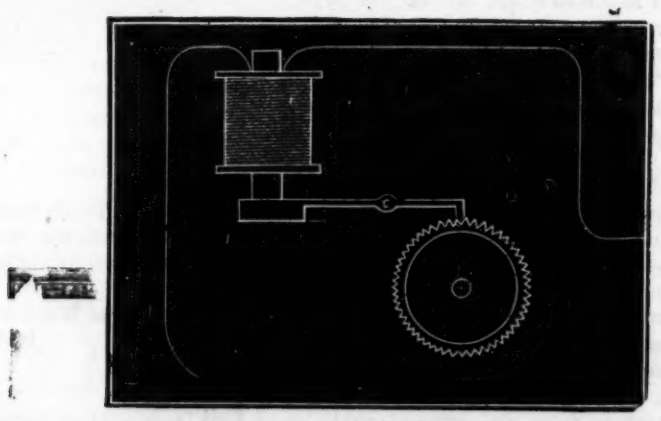


FIG. 2.—ELECTRIC PAWL OF WHEATSTONE'S CLOCK.

* Abstract from a lecture delivered before the Franklin Institute.

* After the lecture, Major Mordecai informed me that he distinctly recalled Prof. Henry's visiting Washington Arsenal, while the pendulums were erecting, and telling him that the velocity could be determined by electricity.

total recorded swing of the pendulum; we must therefore find out what it amounts to in swing, and deduct it in each case from the whole observed oscillation. This is done by means of a disjunctor, an instrument that cuts the circuits of both targets simultaneously. The swing recorded under these circumstances corresponds to the instrumental time.

(TO BE CONCLUDED.)

Methods of Preventing Deterioration of Open Circuit Batteries, Resulting from Accidental Short-Circuiting, in Electric Gas-Lighting Apparatus.

BY A. LIVINGSTON BOGART.

In the domestic use of electricity, the various demands, such as compactness, cleanliness, freedom from deleterious fumes or use of corroding liquids, and a minimum of attention, make the use of open circuit batteries a necessity. Such batteries, however, although ever ready, cleanly, and producing a current of comparatively large volume in comparison to their size, are capable of generating such a current but for a few moments at a time, and should they be called upon to operate steadily for more than a few minutes continuously, rapidly polarize and lose their power, becoming utterly useless for practical purposes, until they have been given an adequate time for recuperation, the period of recuperation depending upon the construction of cell and length of time that the circuit has been closed.

It is usual to guard against the accidental pressure of any exterior object against the circuit-closer or button, by surrounding the same by proper cases of wood or metal.

Where such open-circuit cells are used in connection with call-bells, annunciators, burglar-alarms, etc., there exists one safeguard against unintentional closing of the circuit, in the fact that should such an occurrence take place, the ringing of the signal bell immediately gives evidence of the fact, the resulting annoyance compelling attention to be given to the cause of the trouble on the part of occupants of the building.

In the case of electric gas-lighting apparatus, as used in private residences, etc., the case is entirely different. There is nothing here to acquaint one with the fact that the battery from some accidental "ground" or closure of

FIG. 1.—SPARK COIL WITH RELAY ATTACHMENT.

the circuit is destroying itself uselessly, and we are only made aware of the fact by a failure of the apparatus to operate when attempting to light the gas.

In this application of electricity, the circuit is composed practically of simply a collection of contact-makers and breakers, all exposed and all subjected to the harshest usage; the wires or chains pendant from the burners inviting maltreatment from children, the curious, and the well-known and renowned amateur electrician who is to be found in almost every household, of some age or other. Thus, from the constant pulling of the pendants day and night; the use of burners as a convenient hat or towel rack; the dusting with whisk-brooms and cleaning of metal fixtures with wet cloths; the turning of chandeliers in order to handily get at globes, thus twisting and destroying the insulation of connecting wires—all make it a matter of no surprise, that however well the burners themselves are constructed and the plant put in, frequent trouble should be given to those using the apparatus by its refusing to respond, and so, not only the user but the unfortunate contractor have their hands full of "fault-finding."

My object in this article is to point out several methods by which these evils may be corrected as far as the battery is concerned.

In the first place, assuming that all wire which is employed, both for mains, branches and fixtures, is of good quality as far as its insulation is concerned, and carefully laid, the premises should be divided into as many circuits as possible. A house should never be wired in one circuit only, for the reason that a fault or trouble in such case at any part of the circuit is a fault for all parts of the circuit.

Although the first cost of wiring in a number of circuits is greater than for a single one, still the expense of wiring is nothing compared to the annoyance and labor of discovering the location of a "ground," should one occur. If the wiring be in but one circuit, any fault will throw the whole system out of use until the trouble be rectified; whereas where the building is divided, the greater the number of circuits the less the number of burners cut off from use by the necessity of disconnecting the faulty circuit.

Of course there is a limit to the number of circuits into which it is practical to divide a building. If it be a private residence, excellent results are arrived at by dividing each floor into two circuits. This division may be made in many ways, but perhaps the most advisible one is the putting all of the chandeliers on one circuit and the side fixtures or "brackets" on the other, for the reason that, as private houses are now built, both centre and side fixtures are to be found in almost every room, and it results from this division that, even if one circuit be by any accident necessarily disconnected from a whole floor, still the other circuit runs through each room, and as a consequence we are deprived of but one kind of fixture in each room, and not from the entire use of the apparatus for any part of the floor.

These section wires should be all brought out to some

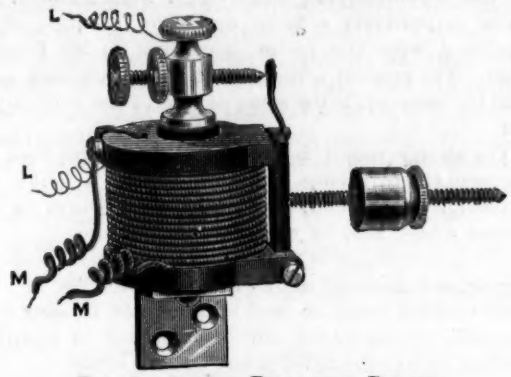


FIG. 2.—SINGLE DETACHED RELAY.

accessible part of the house, where they should concentrate in a switch-board. Perhaps the same position as that chosen for the burglar-alarm annunciator is preferable, for the reason that it is then within the control of the master or mistress of the house. At the switch-board each section should have its own switch plainly marked with the name of the section which it controls, so that any or all of the circuits may be connected or disconnected at will.

We are now provided with the means of confining any fault that may arise to a single circuit or minimum of all of the burners in the house, but some device must be added

FIG. 3.—ELECTRO-THERMIC CUT-OFF.

to enable us to know when trouble takes place at its incipiency and before the battery has been short-circuited long enough to cause any serious deterioration.

Several methods may be employed for this purpose, one of which is an apparatus designed to give an audible signal whenever the circuit remains closed for an abnormal period of time.

Fig. 1 represents one of the simplest forms of such alarm signal, in which the spark coil, which is always included in any gas-lighting circuit, is employed to close

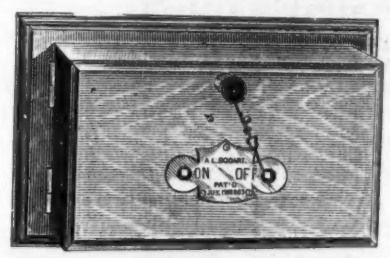


FIG. 4.—MAIN LINE CUT-OFF—EXTERIOR VIEW.

a local circuit to operate a call-bell. The core of iron wires of the coil is extended a little beyond the wooden head. Mounted upon the right-hand head is an armature lever, the armature being placed directly over the termination of the core. Two binding-posts are also attached to the wooden head, one of which, the upper, has a fixed contact point; the other is in connection with the armature lever by means of a flat spring. The other end of the lever is provided with a contact point situated in line with the fixed contact of the upper binding-post, but is pre-

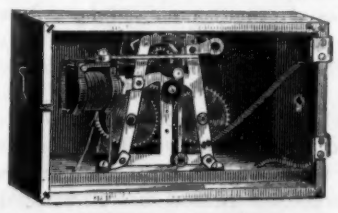


FIG. 5.—MAIN LINE CUT-OFF—INTERIOR VIEW.

vented from coming in contact through the spring of the lever.

The main gas-lighting circuit passes through the spark coil by means of the two binding posts marked *M M*. A single cell of battery and an ordinary box-bell are put in circuit with the two posts marked *L L*. Should now the gas-lighting circuit be closed, the coil will be energized and cause the armature to be attracted, bringing the two contact points into connection, thus closing the local circuit and causing the call bell to give an alarm as long as the gas-lighting circuit remains closed. As for the ordinary purposes of gas-lighting, the ignition of a burner, the time between the closing and opening of the circuit is practically instantaneous; the momentary action of the armature of the coil is, therefore, not sufficient to insure an action of the bell, and hence the alarm will not be sounded unless either an action has taken place, or the contact at the burner has been purposely prolonged beyond the necessary time.

Should the alarm be given, it is only necessary for those in charge to turn off the section switches one after the other until by the turning off of the one which causes the bell to cease sounding, the defective circuit is indicated, when this switch may be left disconnected until the fault is discovered, the others in the meantime being again turned on and put into use. Instead of making use of an extra cell of battery for the local, branch wires may be run to the posts *L L* from the main battery.

Fig. 2 represents a relay which is independent of the spark coil, and which may therefore be inserted anywhere either in the main or branch circuits, the gas-lighting circuit being connected to the wires *M M* and the local with its bell and battery to the points *L L*. Its operation is identical with that before described, only here are added means for adjusting the distance of the contact points from one another. The play of the armature and the retracting device, which here is a counter-weight upon a threaded rod, is determined by the position of the weight, which may be varied to suit the battery and length of circuit, so that any degree of delicacy of action of the instrument may be insured. The resistance of this relay should be made very low by winding with coarse wire, so that its effect in reducing the size of the spark will be but trifling. The proper position of this relay should be with the alarm bell upon the switch-board.

The two devices described will give an alarm should the gas-lighting circuit anywhere be closed for more than a sufficient length of time for the purpose for which it is intended, but such an alarm is only intended to notify others that there is trouble which they must attend to.

Unfortunately in private buildings there is no person usually whose duty it is to remain on guard to receive such calls and attend to the necessary manipulation of the

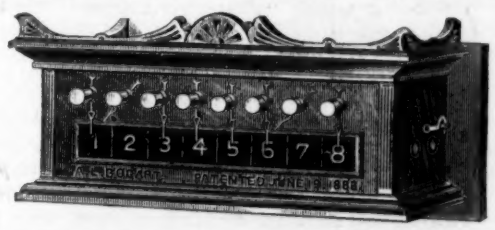


FIG. 6.—SECTIONAL ANNUNCIATOR CUT-OFF.

switch-board when an alarm is given. And, again, it is very possible that when an alarm is given, the occupants of the house may be in some remote part of the building when the bell is sounded, and thus the local battery give out and the bell cease sounding before they are apprised of the fact that a call has been made. If the calls of this instrument are promptly attended to, nothing more perfect could be desired; but, unfortunately, in the majority of households, what is the business of all is the business of none, and the advantages and conveniences of the apparatus are never so much appreciated until some night when through lack of attention to the calls of the monitor we are without it, when the fault is not laid to our own negligence, but to the imperfection of the system in that "it will not attend to itself."

This natural demand for a self-acting safety-switch has stimulated invention to the production of what is known as "the automatic cut-off." Figs. 3, 4, 5 and 6 show various forms of this device.

Fig. 3 is a form the actuating principle of which is the well-known fact that a current will always heat any conductor through which it is flowing, and that metals expand in their linear dimensions with an increment of heat.

The circuit breaker is of the gravity drop principle, and is retained in its normal position, keeping the circuit closed by means of a curved strip of highly expansible metal, which if heated will release its hold on the drop, permitting it to fall and at the same time open the circuit. The battery current is carried through the contact-points and from there along the surface of the expansion strip through a conductor having a sensible resistance, then out of the case to an outside binding-post.

A regulator is provided, by means of which the operation of the instrument may be adjusted to any battery current, and the time for which the circuit may be closed without the instrument cutting off be regulated.

A separate binding post is also supplied, by means of which an alarm-bell may be included in the circuit, which will be sounded by the main battery after the main circuit is opened by the instrument.

Should any circuit in connection with the instrument be kept closed for more than the predetermined time, the current by heating the resistance will cause the expansion strip to act, releasing its hold on the drop, which falling breaks the circuit and at the same time indicates the fact, the word OFF appearing at the window in the front of the case. To reclose the circuit, it is only necessary to return

the drop by means of a knob on the exterior of the case, the word ON being then visible at the window.

Of course, where there are several circuits, each varying in resistance, the time during which the circuit may be closed will vary with the resistance of the line, but in practice this variation is not detrimental to the operation of the instrument, excepting where the differences of resistance of the lines is great. For this reason, where both ordinary hand and automatic burners are in use, a separate cut-off should be employed for the automatics, their resistance being so much greater than that of the circuits of the hand burners.

Fig. 4 shows a different type of cut-off. The exterior is simply an oblong wooden case, provided with an arrow indicator, which may occupy one of two positions, ON or OFF, referring to whether the battery is, or is not, in electric connection with the gas-lighting circuits. Fig. 5 shows an interior view of the instrument. A small electro-magnet is included in the main circuit. The armature of this magnet is attracted each time that the circuit is closed at any point. When the armature is drawn down to the pole, it performs two functions. First, it releases a clock-work train, which causes a cylinder provided with a screw thread to revolve as long as the armature is attracted; and second, it engages a flat steel spring, carried by the armature, in the thread of the screw. The screw causes the flat spring to be constantly carried to one side until it strikes against another spring which supports a lever made fast to an arbor, upon the outside end of which is secured the arrow indicator. By this movement the lever is deprived of its support, and it falls, breaking the circuit and at the same time indicating the fact on the outside of the box by the new position of the arrow.

By replacing the arrow in its original position the circuit is again closed. These instruments may be set for any required time. The magnet operating them is of extremely low resistance, thus not interfering with the spark; and they will operate as well with a long as a short circuit, or for circuits of hand burners or automatics.

It will be unnecessary to say, that unless the circuit is closed for the entire length of time for which they are adjusted, that they will not cut off; since as soon as the circuit in that case is opened, the armature resumes its normal position, stopping the clock movement and at the same time withdrawing the flat steel spring from its engagement with the screw, when it immediately resumes its original position.

As it is comparatively seldom that short-circuits occur, and at each time the movement of the clock is but a short one, one winding is sufficient for more than a year.

The apparatus shown in Fig. 6 is of the same construction as the above, but arranged so that instead of disconnecting the battery from all of the circuits when it acts, it disconnects only the circuit grounded, leaving the rest of the circuits in connection with the battery.

"The Electric Motor and its Applications."

One of the most engrossing subjects of experiment and discussion among electricians at the present time is the electric motor, the countless uses for which, operated by primary battery, secondary battery, or dynamo-electric machine, become daily more apparent. America is, if anything, a little behind Europe in this matter, but electric motors are now being introduced extensively in all our large cities, and numerous electric street railways are projected or nearly completed, in addition to those in highly successful operation at Baltimore, Md.; Windsor, Can.; South Bend, Ind.; Montgomery, Ala.; Minneapolis, Minn. Hence has arisen a demand for fuller information on this most recent application of electricity, and, to meet the want, the first American book on motors has been prepared by the associate editors of THE ELECTRICAL WORLD. The work, now going through the press, will be ready early in September. It will be a handsome quarto of some 250 pages, with about 150 illustrations. It deals with the motor historically, and then goes on to describe the modern motor in all its practical applications. Very little of the matter has ever appeared before in book-form. The application of motors to street railways and the use of motors industrially are dealt with very fully and comprehensively. The publisher is Mr. W. J. Johnston, Potter Building, New York.

Pendleton's Method of Attaching Electric Motors to Tramcars.

It would seem that the development of the electric propulsion of street cars might be greatly advanced by a device to allow of a ready and cheap method of attaching the motors to the existing cars. Acting upon this idea, Mr. John M. Pendleton, whose far-sighted inventions in connection with the electric propulsion of cars we have already had occasion to refer to, has designed an ingenious plan of attachment for this purpose, which we illustrate in the accompanying engravings, Figs. 1 and 2. These show respectively a front and side elevation of a car equipped with the motor, according to Mr. Pendleton's plan. The general arrangement of wheels and axles, it will be observed, is the same as that of the ordinary horse car.

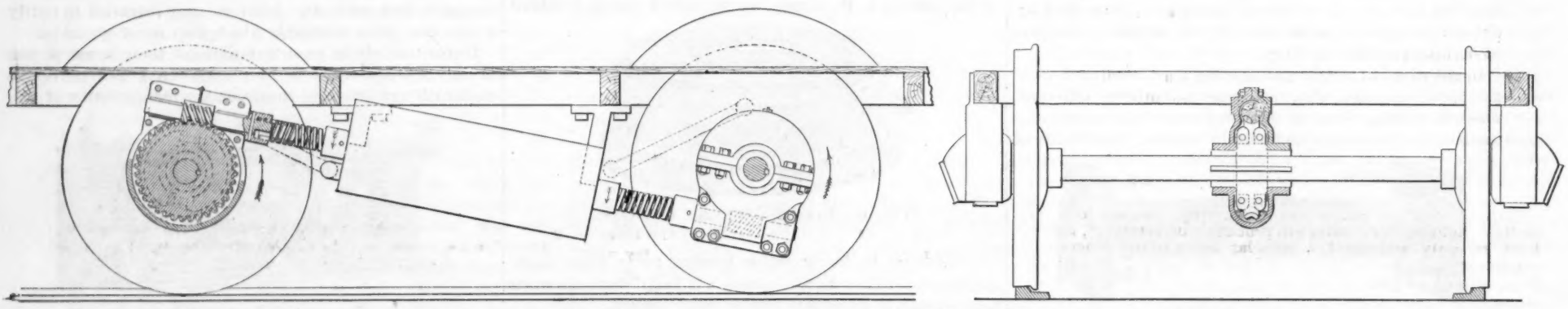
The electric motor is suspended from the floor of the car, and the revolving armature carries a coiled spring extension at each end, terminating in a worm or screw-pinion wheel, held by journals on each side.

The interposition of the spring presents several advantages, for it not only allows for the distortion of the car with varying loads, or from other causes, tending to throw the axis of the motor out of line, but in addition the springs relieve the axles of any sudden strain due to rapid starting or stopping of the motor. The retaining links beside the springs allow of torsion, but limit the extension and contraction of the shaft where heavy strains occur, such as on the ascent of heavy grades.

It will be noted that the two axles are differently geared, one having the worm pinion on the top, and the other at the bottom of the worm wheels, respectively. By this arrangement the thrust on the motor is equalized and friction on the collars is avoided.

The worms are cut with a coarse pitch so as to allow free movement of the car; but the speed is reduced by the worm wheels attached to the axles, in the ratio of 12 to 1, enabling the motor to operate at the rate of 1,000 revolutions, corresponding to a speed of 8 miles per hour for the car.

With the idea of adapting the system to existing rolling stock, the worm wheels are split and securely bolted to the axles and keyed in addition. The hub of the split worm-wheel carries a cover or box, which is made oil-tight and which surrounds the worms. These boxes are filled with oil, which insures a constant and copious lubrication, reducing the friction and wear to a minimum, and preventing the access of dust to the working parts.



FIGS. 1 AND 2.—THE PENDLETON METHOD OF ATTACHING ELECTRIC MOTORS TO ORDINARY STREET CARS.

Anglo-American Cable Figures.

At a meeting of the Anglo-American Cable Company, held in London on July 29, at which Mr. Monck presided, the semi-annual report was read. It states that the receipts for the half year, including £4,096 brought forward, amounted to £116,737, showing a decrease as compared with the first half of the preceding year of £22,321. The falling off is attributed to competition, the reduced tariff, and the continued depression of trade in Europe and America. The total expenses for the half year were £46,813. It is not proposed to declare a dividend for the past quarter, but to carry forward the balance of £2,423, besides £50,000 to be devoted to the renewal fund. The directors say they believe that sooner or later a low tariff will be compulsory, therefore, by taking time by the forelock and making an earnest effort to establish a low tariff they hope to secure the cordial approval and help of the public, without which they cannot succeed. Mr. Monck said the company did not intend to add to the renewal fund after December unless some unforeseen disaster compelled it to do so. He considered that the Commercial Cable Company had given rebates unfairly, compelling the companies in the pool to lower their rates. The report was adopted with a few dissenting votes.

The Arcade Railway Fight.

The Arcade Railroad Company, planning to build an underground Broadway railroad, was last week served with the summons and complaint in the suit brought in the Supreme Court by John Jacob Astor and others, to wind up its affairs, on the grounds that it will ruin Broadway and Madison avenue, and that the act under which it is acting is unconstitutional. Among those who are parties with Mr. Astor to the suit are William Astor, Henry Hilton, O. B. Potter, William D. Sloan, the Methodist Book Concern, Elias S. Higgins, the Chemical National Bank, all the Lorillard estates, the Western Union Telegraph Company, J. Pierpont Morgan and the Park National Bank. The amount of property represented by these plaintiffs is over $50,000,000 on the two thoroughfares named. In brief, the complaint shows that under the acts of 1873–74 no rights were ever vested in the company; that its corporate powers ceased in 1878; that the act of 1881 was passed subsequent to the constitutional amendment forbidding the Legislature to grant the right to lay down railroad tracks; that the act of the present year is unconstitutional, because it grants immunity to a corporation and its stockholders, gives the right to lay down tracks, attempts to revive a defunct corporation and restore its powers, grants an exclusive privilege and a franchise of twice the space in the street of the former bills. Judge Dillon, A. P. Man and Joseph S. Auerbach have been retained as Mr. Astor's counsel.

Canadian Pacific Telegraph Lines.

Another source of competition with the Western Union monopoly will soon be found, it is said, in the connections to be established between lines of the Commercial Cable Company and the Canadian Pacific Telegraph Company. Some details were given in these columns last week. The contracts have been drawn and work has been begun which promises not only to place a rival to the Western Union in the far West, but to furnish direct communication from Europe to the Pacific coast and intermediate points. According to the contracts, several important connections are to be made without delay. Beginning in the East, a wire will be run from Richford, just below the Canada line in Vermont, to Montreal. Work has so far advanced on this branch that it is said it will be completed in about a week. The second connection is at Morristown, N. Y., from which place a wire has been run across the St. Lawrence and up to Brockville, Canada, where it joins the Canadian Pacific wires. This connection has been perfected. The third is at Niagara Falls and has been made.

Naturally the longest connections are yet to be established. One line will be run, according to the contract, from St. Paul to Winnipeg, Manitoba, and another from Salt Lake to Medicine Hat, a station on the Canadian Pacific in British Columbia. The western connection will join New Westminster, in British Columbia, and San Francisco. At the office of the Commercial Cable Company, Mr. Ward, the general manager, said last week that Mr. Mackay and several of his friends had personally undertaken the construction of this line. It will pass through Portland, Oregon and Sacramento. The promised connections will pass over 4,000 miles of territory in addition to the distance traversed by the Canadian Pacific lines. It is announced that the work of construction will take about six months.

Compound Wound Machines.

The method of dynamo construction known as "compound winding," by which perfect self-regulation can be obtained for incandescent lighting dynamos, is the property in this country of the Brush Electric Company, of Cleveland, Ohio, as covered by the patents of Charles F. Brush. These patents are the property in England of the Anglo-American Brush Electric Light Corporation, Limited. The English Company has adopted the policy of licensing other prominent dynamo builders, and the following, among the principal electrical firms of England, have taken out licenses from the English Brush Company, under royalty, for the manufacture of compound wound machines:

Siemens Brothers & Co., Elwell-Parker Limited, Edison & Swan United Electric Light Co., Paterson & Cooper, Mather & Platt, Greenwood & Batley, Dr. Paget Higgs. The only prominent manufacturers in England who seem to infringe, or question, the Brush patents, are R. E. Crompton & Co., with whom the Anglo-American Brush Electric Light Corporation are now in litigation, and the suit will probably be decided within the present year.

The Electric Light in Cincinnati.

General A. Hickenlooper, the President of the Cincinnati Gas Company, has been furnishing some fat advertisements to the local press, in the shape of his harangue before the special sub-committee of Council on the ordinance now pending to grant a ten years' franchise to the Central Edison Electric Light Company, of Cincinnati, O., that company offering to light the city with Edison lamps below the price of gas. The Hickenlooper "argument" occupies more than three solid pages of the *Commercial Gazette* and a like portion of the other papers, and is very amusing. The *Gazette* characterizes it as being as "readable as a romance." The phrase is a good one and highly applicable. The "argument" is summed up in one of the heavy head-lines thus: "Facts and figures which cannot be controverted, proving that electric light is on the wane, is unreliable, dangerous to life and property and invariably more expensive than gas."

As to the wild assertion that the "electric light is on the wane," we need but point to the fact that to-day far more electric lights, both arc and incandescent, are burning than ever before, and that large new plants and stations are started every day of the week, many of them by gas companies. So rapid is the growth of the business, the supply of electricians and apparatus can hardly keep pace with it; while wherever the light is good it is so greatly in demand that the number of lights is on the increase. To prove his case, however, General Hickenlooper goes back to statements made in 1882, 1883 and 1884, and quotes freely from journals and men whose enmity to the electric light is a matter of notoriety.

His view of progress is that as accidents sometimes happen on railways with damage and loss of life, railways must be given up; and that because some railways are got up for stockjobbing operations, all railways are intended to be a means of fleecing the public. Our columns, week by week, give abounding evidence of the vitality and solidity of the electric lighting companies of America. But we will not rely for refutation on the undeniable facts and figures furnished by our own columns; they can also be found elsewhere. Last year, the *Scientific American* denounced the arc lighting business as a swindle and a fraud. We objected to such language as utterly without foundation. Our contemporary has since then made inquiries on the subject, and has totally changed its views. We quote the following from its issue of June 28:

ELECTRIC LIGHTING AN AN INVESTMENT.

With a view to put at rest the question whether local electric lighting companies are profitable investments, we have recently addressed a circular letter to the general managers of a number of such companies, both East and West, asking for their experience in the matter. We have directed our inquiry in this instance particularly to those operating the Thomson-Houston system.

We have received answers from all parts of the country, and the general tenor of the replies is that many of their local companies are earning better dividends than are yielded by the majority of other new enterprises. The question of profit rests first with the locality, and then, if this be judiciously chosen, with the system employed and the ability displayed in the management.

Of those who have stated the exact profits of their investment, we believe the highest returns came from Omaha, Neb., where a company, operating four 30-light dynamos, had earned at the end of the first three months after incorporation 4½ per cent. on the investment, or at the rate of 18 per cent. per annum. Two more dynamos of the same capacity have since been added to their plant. The gentlemen connected with this company are so well pleased with these results that they procured a franchise for operating in Des Moines, Ia. They began by running 65 arc lamps, but have since increased their plant.

Replies have also been received from Washington, St. Louis, Worcester, Terre Haute, Auburn, Me., Salem, Mass., Quincy, Ill., Kansas City, etc., which confirm these results, and state emphatically the belief of the writers in the desirability of electric lighting as an investment.

These conclusions, although derived from the working of the particular lighting system we have named, may be equally valid and reliable for other systems now before the public, although we are advised that a greater number of local companies are operating their system than any other, and we find these companies uniformly successful so far as our inquiries have extended. There is room for great extensions of these local lighting companies in all parts of this and foreign countries.

So much for the wane of electric lighting. What is said above may appear to relate to arc lighting. In incandescent lighting, there are at least half a dozen strong companies contending for business, and it certainly should be significant to Gen. Hickenlooper, and those who, like him and the ostrich, bury their head in the sand to avoid danger, that at the head of those companies stand men of the widest and highest reputation as capitalists and inventors. Moreover, if the electric light is such an unreliable thing, it is very strange that it should be the sole dependence of an increasing number of buildings, of all the finest steamers afloat, and of all the new men-of-war, American or foreign.

Regarding "danger to life and property," it is known to all, we would say, that the electric light comes nearest sunlight in purity, and yet gives off little heat. Hence the electric light lengthens life and prolongs the time during which property is valuable or ornamental. Gas is unquestionably dangerous to life and property from the fact that it vitiates the air and gives off certain products that spoil books, fabrics, pictures and furniture. Besides, gas is directly dangerous to life far beyond electricity. According to authoritative statistics the value of property destroyed by fires from oil and gas in 1885 alone was $3,000,000. That is very far beyond the total loss from fires due to electric lights, from the first light started down to date. Moreover, while a very few lives have been lost by electric shock, the number of deaths yearly due to gas is so large that legislative measures are called for to put a check on them.

As to the last point, that the electric light is invariably more expensive than gas, we would point out that Gen. Hickenlooper is now raising his voice in angry eloquence against the offer of the Edison Company to supply light more cheaply than he does. Hence his tears and groans! The weakness of his case may be inferred from the fact that he drags in Mr. Robert Hammond and Dr. "Podget" Higgs from England to prove his statements, and that he quotes Mr. W. H. "Pierce" as saying that "in his own house, the electric light costs just twice as much as gas." It happens that Mr. Preece has his own private plant, and thus is making light on a small, retail scale; nevertheless he is getting pleasure and satisfaction out of it that no gas, oil, or candle ever gave him. The real answer to General Hickenlooper is that, light for light, and making equal quantities of light, electricity is just as cheap as gas, and far safer and purer, as hospitals and factories alike testify.

We have no quarrel of our own with gas interests. On the contrary, we note with pleasure the readiness with which gas companies are themselves introducing the electric light. It is a sign of wisdom and shows that the public wants the light and is willing to pay for it a fair price. But when an advocate like Gen. Hickenlooper gets up to attack a whole industry for the sake of defending his own little perquisites, we feel called upon to take exception to the falsities he terms facts.

Lighting a Theatre.*

Probably the most important investigation this year has been made by Dr. Breslauer, in Berlin. The question was to determine the difference, if any existed, between the effect of illumination by gas and that of electrical light on the air in a large crowded building (*Deutsch. Med. Zeit.*, Jan. 21, 1886). For this purpose the Royal Theatre, in Munich, was selected, and the experiments were made with that thoroughness with which they are usually undertaken by German scientists.

The air was examined in the parquet, the gallery and the centre of the latter, and observations were made while the house was full and when empty. The results were as follows: With electric light and with gas the increase of temperature noted from beginning to end of play was:

	Electrical light.	Gas.
In parquet	2.5	25.1
In gallery	8.1	26.1
Centre of gallery	9.3	26.7

The percentage of carbonic acid per mille was:

	Electrical light.	Gas.
In parquet	0.055	3.926 (!)
In gallery	0.870	3.151 (!)
Centre of gallery	1.178	4.353 (!)

Under the effect of gas the percentage of carbonic acid increased, therefore, above the limits of safety from 1.81 to 3.35 per mille! Many other observations concerning the percentage of watery vapor, etc., were also made; but we simply mention their result, together with the investigator's résumé of the whole.

1. The air with electrical illumination does not reach in a theatre the former high temperature, a fact especially of advantage to those frequenting the gallery.

2. The air remains purer; it contains far less carbonic acid, and almost no smoke particles.

3. There is no longer so much moisture added to the air as used to be the case with illumination by gas, and the less the percentage of moisture in a crowded room the more agreeable will be the air to persons living in it, and the less favorable will be the conditions for the development and the propagation of pathogenic germs, especially if the moisture diminishes in the same ratio as the temperature sinks, always occurring under the effect of the electrical light.

4. The quality of the air has become a far more uniform one in all parts of the house, while with illumination by gas the air becomes the hotter, the more moist, and the more impure, the higher situated the seats are.

For hygienic purposes in the same theatre another alteration has been made, viz., the substitution of more opaque glass for the globes of the electric light. Though the illuminating power has diminished under its use from 20 to 25 per cent., the effect on the eyes is less injurious, as it produces a peculiar mellow light, very agreeable to the eyes.

The New York Fire Telegraph "Plant."—A report made to the Fire Commissioners by Superintendent Smith, of the Fire Telegraph Bureau, shows that it will cost $20,000 to remove the "office plant" at Fire Hall to the new home of the department, on Sixty-seventh street. Superintendent Smith urges the Commissioners to have the work begun as soon as possible, as he believes it will occupy two months and should be done before the frost comes. The Superintendent looks upon the continuance of a temporary office plant at the old place until the new one is thoroughly tested as desirable.

* *Medical and Surgical Reporter.*

A Lightning Flash.

BY GEORGE EDGAR MONTGOMERY.

That brief, wild flash, it seems to me
  Was some unmeasurable power,
Some devasting force set free
  In a sublime, chaotic hour.

A force beyond our groping thought,
  Beyond our will and knowledge; yet
I know that fearless men have caught
  The lightning of the heavens and set

Its fire within their eager hands,
  Shaped it, and used it to their need,
As, by their labor, in our lands
  The flower takes beauty from the seed;

I know that every drop of dew
  That hangs on purple lilac bells,
Or on the ever-greening yew,
  Holds locked in its transparent cells

A fire as fierce and strong and loud
  As that which shoots in jagged lines
Out of a summer thunder-cloud
  And scars the lofty trunks of pines.

—*Century.*

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, August 2, 1886.

The New York Safety Steam Power Company is under contract with the Edison Illuminating Company to erect two high speed engines of 150 h. p. each, in the new annex station, 60 and 62 Liberty street; same to be under steam by Sept. 1st.

The Poughkeepsie Electric Light and Power Co. has recently increased its plant by the addition of one 100 h. p. and one 75 h. p. N. Y. S. S. P. high-speed engines. These engines are supplementary to two Armington-Sims engines, which have been in service about a year.

The Norwich (Conn.) Electric Light Co. has just put in an 80 h. p. N. Y. Safety Steam Power Co. engine and 150 h. p. boiler; the plant being erected by M. J. Daly of Waterbury, who is rapidly coming to the front as a contractor for electric light plants.

The Edison plant, which will soon be shipped for the purpose of illuminating the palace of the King of Corea, embraces several artistic adaptations of the incandescent light. Chief among these are two vases, with flowers which contain small 4 c. p. lamps distributed among them in the shape of flowers. When lit up, the effect is very fine, as I have had opportunity to witness at the offices of the Stout-Meadowcroft Co., who designed and executed the ornaments. The storage battery furnished by this firm to the American Opera Company, and used by them for several months on their tour, although subjected to some pretty rough handling, is still in good order, and the lighting effects produced by its aid are the delight and wonder of audiences everywhere.

The third of the five Sims electrical torpedoes, which are being built for the Government at the Edison Machine Works, No. 104 Goerck street, has been finished and will be shipped at once. These torpedoes, which are all made alike, are submarine vessels, consisting of a cigar-shaped copper hull—the torpedo proper—forty-five feet long and about two feet in diameter at the widest part, attached by upright steel stanchions to a copper float, which rises some six inches above the surface of the water. Placed fore and aft on the float are two rods for showing signal flags, balls or lights. These rods are hinged at the base with a spring-hinge, so as to assume an oblique or horizontal position when meeting and moving under an obstruction, and to recover their position automatically when it is passed. Both hull and float are protected from cables, ropes and other obstructions by a sharp steel blade, which runs from the bow of the hull to the top of the float, and from the stern of the float to the stern of the hull, and is set at such an angle as to make the torpedo dive under or cut through any obstacle. The hull or torpedo itself is made up in four parts or sections united by lock joints. The bow section contains the explosive charge, from 250 to 400 pounds of dynamite; the second compartment is filled with cable, which connects the torpedo with the shore, and is paid out as the vessel proceeds on its errand; the third part contains the dynamo, which supplies the power for propelling, guiding and exploding the torpedo; in the stern section are placed the steering apparatus and the shaft of the screw propeller. The operator from his station on shore or on shipboard can at will start, stop or steer the dangerous craft and explode the charge, which can also be arranged to explode by contact if desired; and he receives notice when the hull meets with any obstruction, thus making sure of the proper moment for explosion. The torpedo weighs, all told, from 3,000 to 5,000 pounds, according to the distance to be overcome, but no single part or section weighs more than 800 pounds. Fifteen minutes is all the time required to take it apart or put it together again. It will run ten minutes at the rate of ten and one-half miles an hour, and it is claimed that it can demolish any man-of-war afloat. The torpedoes cost the Government, it is said, $5,000 apiece. Representatives of the English, French, Turkish and Japanese Governments have been inspecting them within the last few weeks with a view to ordering some made for themselves.

Mr. H. N. Curtis, the New York agent for the Thomson-Houston Company, July 27 scored another order for the aqueduct, Chas. Peterson & Co., the contractors, having secured the plant to take the place of the dangerous gasoline that was used. The new installment is one dynamo and ten lamps. With this order, Mr. Curtis has placed 10 plants of a capacity of 130 lights in all, and 10 dynamos of a capacity ranging from 10 to 15 lights. Since then, 3 more plants of 10 lights each have been added, for Brown, Howard & Co., the Yonkers contractors.

The Edison Electric Light Association meets the second week in August at Long Beach Hotel.

A very pleasant fishing excursion was had by the Electric Club and its friends on Saturday last. The party went to the fishing banks, off Long Branch, early in the morning, and did not return until night. The fishing was generally good, and has given rise

to the usual number of fish stories. Among those present were Gen. C. H. Barney, Secretary of the National Telephone Exchange Association; H. C. Davis, President of the Electric Club and Treasurer and General Manager of the Consolidated Electric Light Company; Major J. B. Powell, Secretary and Treasurer of the Brush Electric Light Company of New England; J. W. Beane, of the Mather Electric Light Company; T. B. Doolittle, of the American Bell Telephone Company; R. J. Montgomery, of the Okonite Company; H. A. Reed and W. Willoughby Marks, of the Bishop Gutta Percha Works; Amos Broadnax, of the Consolidated Electric Light Company; Lieut.-Commander Toppan, of the Railway Telegraph and Telephone Company; Major George W. La Rue, C. E. Stump, J. C. Spaeth, C. C. Sharp, E. Louis Smith, C. W. Price, M. W. Goodyear, H. S. Thornberry, H. N. Curtis and C. H. Davis.

Holmes, Booth & Haydens have ready some very useful new sample cards of insulated electric light wire and insulated telephone and telegraph wire. These wires are very creditable specimens of such goods, and one can easily understand w t- mand for them is so brisk. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Mass., August 2, 1886.

At a meeting of the Common Council of Salem, Mass., on July 27th, it was voted to adopt the fire-alarm system of Messrs. Pearce & Jones. It is estimated that the cost of placing the entire system in operation will be about $5,000.

Mr. Geo. M. Stevens, of Boston, of tower-clock renown, and manufacturer of an efficient fire-alarm system, has been awarded the contract for furnishing the town of Hyde Park, Mass., with a full and complete equipment of his fire-alarm apparatus. The contract calls for ten miles of wire. Mr. Chas. L. Bly, of Boston, will put in the poles and do the wiring.

The Charlestown, Mass., Gas Company, has filed a petition with the Board of Aldermen of Somerville, Mass., asking leave to erect poles for electric light wires in the streets of that city.

The contract between the Electric Light Company and city authorities of Salem, Mass., reference to which was made in my notes in preceding number of THE ELECTRICAL WORLD, was signed by the latter on July 27. The contract calls for 104 instead of the 101 arc lights previously stated, and the entire number are to be ready and burning not later than the 30th of September. The contract is to run two years from October 1st, 1886, and the cost to the city for electric lighting for the two years will not exceed $35,000 for burning the 104 lights all night.

The Edison Company for Isolated Lighting has, through its New England agency, commenced the installation of a plant of 150 16 c. p. lights in the factory of the Boston Cordage Company in South Boston. The same company has received an order from Great Barrington, Mass., for an increase of the lighting capacity of the Edison plant at the Kellogg Terrace, from 150 to 300 lights. A contract has also been closed between the Boston *Da ly Globe* and the above-named company for the installation of 600 16 c. p. Edison lights, in the magnificent seven-story building of the former, now nearing completion. The plant will be one of the finest installations of its size in the country, and will comprise two of the best engines ever turned out of the Armington & Sims Works. The Edison dynamos, three in number, each of a capacity of 200 lights, will be models of electrical ingenuity and mechanical handiwork. The Edison Company is further installing a 300 16 c. p. plant at the Amoskeag Mills, at Manchester, N. H., and a 200 16 c. p. plant at the Stevens Linen Mill, at Haverhill, Mass.

Messrs. Sowdon, Elder & Wright have established themselves at No. 131 Devonshire street (Rialto Building), this city, and will act as sole agents in New England for the American system of arc lighting. Another—and a very important—branch of the business of this new firm is that they will contract for, build, and equip central lighting stations and isolated plants for either arc or incandescent electric lighting. The long experience in the electric light field had by the members of this firm qualifies them to do any work of this kind intrusted to their hands, in a satisfactory manner. Mr. F. Montague Sowdon, the senior member of the firm, was formerly Treasurer of the American Electric and Illuminating Company; Mr. Samuel Elder was until recently the private secretary of President E. H. Goff, of the same company, and Mr. L. B. Wright was for a long time constructing engineer of that company.

On the evenings of July 29 and 30, the Chemical Electric Light and Power Company gave an exhibition of incandescent lighting from "Volta Pavia" solution, in a passenger car in the Boston & Albany R. R. station, this city. Thirty (one gallon) cells of "Volta Pavia" were placed on the ground near the car, and wires connected from them to eight 16 c. p. incandescent lamps suspended in the interior of the car, four on each side, twelve feet apart. When the lights were turned on it was pleasing to observe the steady and brilliant illumination of the entire car, without the customary heat which is inseparable from either gas or oil lamps. On the same track was another car, identically the same in size and pattern as the other, lighted with sixteen large oil lamps, having patent duplex burners.

The party of gentlemen who were present critically viewed the lights produced in both cars, and in drawing a comparison between car No. 1 with electric lights and car No. 2 with double the number of lamps, the verdict of superiority in light was unanimously conceded to the former. Before the close of the test, it was demonstrated that the eight 16 c. p. lamps could be worked satisfactorily with only 24 of the 30 cells of "Volta Pavia;" and it was shown that either number of cells could be conveniently placed in a compartment (made for the purpose) under the centre of the car, so devised that each cell of solution would be easy of access. It is reported that another test will be made in a few days before a committee of prominent railway officials, when the same solution and accessories for isolated incandescent lighting will be used.

The American Automatic Fire Alarm Association, of this city, is now doing an extensive business with its system of automatic alarm. Mr. B. T. Morrison, formerly connected with the Boston Tariff Association, was elected treasurer of the association in June last, and is succeeding in rapidly bringing the system into public notice. An open circuit system is used by this association, and the objections usually raised against this system of wiring have been met and overcome.

By a very simple and ingenious automatic testing clock, every inch of wire that is put into a plant is automatically tested at least twice a day, and a record of such test is kept in the form of a punched dial. When a watchman is employed, the system is so arranged that the watchman us s and tests all of the fire-alarm wires, leaving a record of his rounds, and yet not ringing the alarm. The instruments are very simple, and are of as fine a grade as will be found in any electrical work. The company has passed through the experimental stage, and the fruits of honest endeavor are beginning to show. Plants are now being put up in Boston, Salem, Beverly, Brockton and Marblehead, and one just completed in Lynn is working in a most satisfactory manner. The thermostats used by this company are sensitive and reliable; they are made by the association only, and are a model of neatness.

The Sun Electric Light Company, of Woburn, Mass., has recently enlarged its electrical and mechanical departments and largely increased its manufacturing facilities. During the months of June and July this enterprising company expended nearly $30,000 in new machinery and tools, and to-day can "point with pride" to as complete and well regulated an electrical manufacturing plant as can be found in this country. The working force of the company has also been increased to about seventy-five people, the majority of whom are experienced in electrical and mechanical work of all kinds. Notwithstanding the increased manufacturing facilities and the large addition to the help, the company makes the statement that it is "way behind on orders for lamps, distributing apparatus and other electrical apparatus." It is safe to predict, however, that under the skillful supervision of the new manager and treasurer, Mr. Frederick Swift, with so able an electrician as Mr. Slattery as his assistant, all the old orders will be soon filled, and after the first of September no delays in shipments of lamps, or distributing boxes, need be anticipated by the patrons of the company.

A. L. Russell, successor of Charles Williams, Jr., Boston, Mass., has still some stock Woodbury electric light testing generators, which he is selling at a greatly reduced price.

Messrs. Temple & Venner, of this city—No. 68 Devonshire street—are doing considerable work in wiring for incandescent lighting in private residences and public building.

A dispatch from New Haven, Conn., under date of July 31, states that William and Wesley Way, telegraph operators in Madison, Conn., were shocked by lightning that evening. The latter is not expected to recover.

The Richmond Carbon Company, North Adams, Mass., has recently increased its manufacturing facilities, comprising new engines, boilers, crushers and various kinds of new machinery.

The report emanates from a reliable source in Hartford, Conn., that the Mather Electric Company of that city had largely increased its manufacturing equipment and the number of its employés. The force now engaged is over 100, but the company will soon have to take on more hands, and make a still further addition to its machinery to enable it to keep pace with orders. The present factory of the company will have to be enlarged, or a removal to larger premises may be decided upon at an early day.

The Shipman Engine Company, of Boston, has taken new offices at the intersection of Pearl and High streets, having found the old quarters at No. 55 Franklin street too cramped for handling its rapidly growing business.

Police Commissioners I. O. Cressy and Michael Newell, of Buffalo, were in Boston last week, and on Friday visited South Boston and made a thorough examination of the police electric and telephonic alarm systems recently put in by the Municipal Signal Company. The officials stated that their city has eleven police divisions, and that they intend to install and operate an alarm system in four divisions immediately after their return home. This will necessitate the construction and placing of 100 signal boxes. So well pleased were the commissioners with the system they have just inspected that the rumor is current in Boston that the Buffalo contract will be given to the Municipal Signal Company within the next 30 days.

On the afternoon of July 30, there occurred a meeting of the stockholders of the Waltham Gas Company, called by the directors for the purpose of obtaining authority to add the manufacture and sale of electricity to their business, President Lowell Clark in the chair. All but 203 shares were represented, and a ballot showed 995 in favor and 2 against the proposed change. These two votes were fatal to the scheme, as a unanimous vote is necessary under the law. These two shares were held by an attorney of Waltham, and the directors claim they were recently transferred to him from his wife's estate, being procured for the express purpose of defeating the movement, in the interest of the Waltham Electric Light Company, recently formed. It was voted to adjourn for four weeks, leaving the ballot open to allow the remainder of the stockholders to vote. The capital stock of the gas company is $120,000. Although at the first the directors were sanguine of success, they have recently known that it would be impossible to obtain a unanimous vote. As now appears the field is left clear for the electric company, and it has certainly secured a good start, having obtained the right from the Aldermen to set poles and wires for electric purposes.

At the same place, a new company, called the Gas and Electric Light Company, of Waltham, was organized on July 31 by ten of the stockholders of the present gas company. The president of the new company is J. R. Farnum; Secretary and Treasurer, G. A. Stearns; Directors, J. R. Farnum, A. T. Lyman, Lowell Clark, J. B. Gooding, Francis Buttrick; other organizers, C. A. Welch, Charles Houghton, Augustus Flagg and Mr. Capen. All are stockholders in the gas company, and a number are directors. The capital stock is $20,000, of which $14,000 is already taken.

The Electric Gas Lighting Company of this city has removed its factory to the large building No. 34 Arch street. A full and complete equipment of new and improved machinery has been put in, and the manufacturing facilities of the company are now more than doubled. Expert electricians and skilled mechanics have been added to the force of employés, a number of whom have had many years' experience in the manufacture of various lines of gas-lighting and other electrical appliances. The company has already gained an enviable reputation for making only thoroughly reliable goods, and now, with its increased manufacturing facilities and its enlarged force of intelligent and experienced workmen, the interests of the company will be enhanced and its trade extended. W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, Aug. 2, 1886.

As the Philadelphia portion of the electrical world has generally taken wing for the seaside and the mountains, matters are consequently very dull in that line here. About the only electrical can't-get-away is Chief Walker, of the city fire-alarm and police service, or his able assistant, and as the summer dullness extends to the newspapers, they have found Chief Walker and electricity in general very fine subjects to relieve the monotony of their columns. This, in turn, has resulted in the publication of some interesting facts, which may be read with profit by electricians outside of Philadelphia. On Wednesday last Chief Walker forwarded to the County Comptroller his estimate of the amount of appropriation that will be required to run the city's electrical department during 1887. The total amount asked for is $178,114, and includes the following items:

For salaries, $16,650; repairs and supplies, $8,000; maintenance and keep of horse and wagon, $400; batteries, acids and materials, $3,500; stationery, printing, advertising and incidentals, $1,000; fuel and ice, $100; for the improvement and extension of the police and fire telegraph, $10,000; rental of telephones and purchase of material and instruments, and extension of the lines, $42,000; for electric lights, now located and up, $70,664; for additional electric lights, $25,000; for electric lights on Broad street, between Fairmount and Columbia avenues, $3,000; for materials, labor and the laying of electric light cables underground on Broad street, between Fairmount and Columbia avenues, a distance of one mile, $3,500; for cables, conduits, manholes, materials and labor for underground electrical service, providing that no part of the item shall merge at the close of 1887, $25,000.

As the total asked for is an increase of $73,000 over the expenses allowed for this year, a leading paper promptly points out that while the expenses in 1884 were only $35,000, in 1885 $84,467, and this year $104,995, the sum of $178,114 is asked for next year—an increase of over 400 per cent. in three years. Nothing could better illustrate the rapid strides being made here in matters electrical, yet those who have been clamoring loudest for an underground system are first to criticise any extra expenditure of any kind. It will be seen that the estimate asks for $25,000 "for cables, conduits, etc., for underground electrical service." In this connection Chief Walker explains that it is intended to put all the city's wires under ground, and thus to demonstrate beyond peradventure the success or failure of the system. Should the plan succeed, the city would then make all the companies bury their wires. There are now seven miles of the city's wire buried on Broad street, above Columbia avenue, which includes an electric light service. With the $25,000 it is proposed to extend the wires north on Broad street, from the Public Buildings to Columbia avenue, a distance of two miles, and to make branches to the different quarters of the city. In these conduits it is proposed to lay an electric light wire for the purpose of determining whether or not the two kinds of service may be made to work together.

Surely this money should be granted, and so permit the city to demonstrate the difficulties of a system which it is endeavoring to force upon the various companies.

Further pursuit of the subject shows that Philadelphia obtains her electric lighting cheaper than any other large city in the country, the average cost being less than 55 cents per lamp per night. This only applies to the city's lights, though, the truth being that most of the companies that do lighting for the city do not make much money by it. Many of them place their figures very low for the privilege of being allowed to place their wires upon the city poles, and cover their loss in the charges to private customers. There are 352 lights paid for by the city, and they cost $10,000 less than they would in most other cities.

The next midsummer diversion was the newspaper report that arrangements were in progress for consolidating the interests of the leading electric light companies in this city, and merging their business into one corporation. Among the companies spoken of in this connection were the Brush, United States, Northern, Thomson-Houston and Philadelphia Sectional Underground, the latter using the Excelsior light. A visit to the offices of the various companies brought forth the most emphatic denials of this interesting piece of news.

Another trial of the electric railway on Ridge avenue was made last week. There was no hitch in the working, but the company seems slow in getting down to practical business. The road skirts the boundary of Fairmount Park, and the hosts of visitors to that part of this vast public domain would make it decidedly consoling, financially, to the promoters of the scheme.

Wilkesbarre, in the northern part of this State, expects to have the Edison light in full blast by September 15. The old Wilkesbarre Electric Light Company has been for some time engaged in enlarging its plant there, for the purpose of introducing the Edison system. The present plant of the company has a machinery capacity of 210 arc lights and a dynamo capacity of 126 lights, of which about 115 are in operation. This capacity is now to be increased, the present arrangements contemplating the introduction of 4,000 incandescent lights, with which business places only will be supplied, though the plant will be subsequently extended so as to provide for the lighting of private houses. The cost of the Edison light to patrons will, it is said, be about the same as gas.

In Easton, Pa., they expect the entire town to be lighted by electricity by the first of September.

In Lancaster, Pa., where the enterprising citizens use the electric light to a great extent, the County Commissioners have just signed a contract with the Edison Electric Light Company of Lancaster, to place the electric light in the Court House for one year from September 1, 129 lights to be supplied, same price as gas. The gas bills for 1884 and 1885 were added and the cost per month was ascertained to have been $58.06, and the Edison company have agreed to furnish the electric light at that figure.

Now, that is a good showing for electricity as against gas, b Middletown, Delaware, where gasoline has heretofore been

has also adopted the electric light. The Blue Hen's Chickens evi" dently know a good thing when they see it—though they cannot grasp the details of it—but let me quote from a Middletown dispatch printed in the *Every Evening*, of Wilmington, Del., in proof of the local enthusiasm: "At last the engine and boiler to be used by the electric light company have arrived, and will be put in place as soon as some one can be found who is fixed for hauling such things. Our carters expected to haul the huge affair, but they backed out as soon as they saw the size and learned the weight. The boiler weighs nearly four tons, and has to be hauled about three squares. A car load of crooked logs is also here, and it is supposed they are to be used as poles along the street, and some one was heard to say yesterday that 'the crooks were intended to give the light a better chance.' Perhaps the idea is a good one, but the poles are ugly all the same. It is expected to turn on at least a portion of the lights next Monday night. The gasoline lamps have not been lighted since the 8th (July)."

Messrs. Tatham Brothers have presented the Electrical Department of the city with 1,500 feet of cable, which will be used in extending the underground cables which were recently laid on Broad street, from Columbia avenue to the Reading Railroad crossing.

The old Electrical Exhibition building of the Franklin Institute, at Thirty-second street and Lancaster avenue, is being rapidly demolished, as you have noted.

We have just had an example here of a worthy and diligent man stepping from the position of telegraph operator to that of bank teller.

John A. McBride sent to the Mayor the other day his resignation of the position of house (police) sergeant and telegraph operator at the Chestnut Hill sub-station, which positions he has occupied for many years. He gave as the reason for his action the fact that he has been appointed paying-teller of the new bank in that suburb.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, July 31, 1886.

I was in Milwaukee the other day, and paid a visit to the mammoth establishment of Edw. P. Allis & Co., manufacturers of engines, flouring mill and saw mill machinery. No fewer than 1,700 men are employed in the acres of building owned by this company, and there is not a corner of the earth too remote or too obscure to be the recipient of this company's varied product. All kinds of engines are turned out, hoisting engines, pumping engines and electric light engines They recently received orders in a single day for one hundred thousand dollars' worth of engines of various kinds. This is business, surely. You lately illustrated their electric light engine.

Mr. Terry, of the Electrical Supply Company here, finds as many orders as he can keep up with. Business, in fact, is all that could be desired. Mr. Terry has done wonders in the two years or so he has been out here. Mr. Cone, of the same company, who recently returned from the Pacific Coast, did a fine business out there.

At the annual meeting of the Rocky Mountain Bell Telephone Company, held July 21 at Salt Lake City, the following named were elected for the Directors for the ensuing year: J. J. Dickey, Thomas Sherwin, C. W. Lyman, H. C. Hill, C. F. Annett, George Albree, Geo. Y. Wallace, George M. Scott, Chas. S. Smith. The officers of last year were re-elected, viz.: C. F. Annett, President and General Manager; J. J. Dickey, Vice-President; Chas. S. Smith, Secretary; Geo. Y. Wallace, Treasurer.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes the following telephone stock quotations:

Bell of Mo.	$150@$152
Central Union	43@ 45
Chicago	365@ 375
Colorado	20@ 22
Cumberland	65@ 70
Great Southern	30@ 32
Iowa Union	15@ 18
Michigan	64@ 66
Mo. & Kan.	57@ 58
Mo. & Kan. Scrip, 55 cents on the dollar.	
Rocky Mountain Bell	40@ 45
United	15@ 18
Wisconsin	103@ 105

W. A. K.

THE TELEGRAPH.

T. M. B. A.—Assessment 199 for August, of $1, is made to meet the death claims of Michael J. Lyons and Joseph T. Anderson.

The Northern Telegraph Company of Savanna, Ill., incorporated by Mr. George B. Harris and others, has a capital stock of $100,000.

Germany and China.—The Marquis Tseng dined at Berlin on July 31 with the crown Prince Frederick William. The special object of the Marquis' mission is to arrange an overland telegraphic service between China and Germany.

Building New Lines.—A special dispatch of Aug. 2, from Ottawa, says: Joseph Atchison, of New York, was in town today, en route for British Columbia. He will superintend the construction of a telegraph line from Port Moody, the Pacific terminus of the Canadian Pacific, to San Francisco. Operations will be commenced in a few weeks. Most of the distance of 1,100 miles intervening between the terminal points will be traversed by land except where it crosses Puget Sound. The promoters are James Gordon Bennett and John W. Mackay, who, by arrangement with the Canadian Pacific Telegraph system, will compete with the Western Union for California business. The line will be completed before the end of November.

Western Union Litigation.—It was reported last week that the verdict recently given against the Western Union Telegraph Company in the suit of Gen. Farnsworth had been compromised, and something like $100,000 paid to settle up all claims. The stock market was boomed on the report. At the office of Col. Robert G. Ingersoll the story was denied with some emphasis. Mr. Dwight Townsend, Secretary of the United Lines Telegraph Company, said that Receiver Farnsworth was out of town and would not be likely to do any settling without consulting his counsel. Col. Ingersoll and Mr. Lauterbach are preparing papers to press suits against the Western Union Company in other States, on the same grounds as those upon which the late verdict was rendered in their favor.

THE TELEPHONE.

Monument to the "Inventor of the Telephone?"—An Italian paper says: "At Aosta, on the morning of July 5, the monument in honor and memory of Innocenzo Manzetti, the inventor of the telephone, was solemnly inaugurated under the portico of the municipal palace. There were present the widow of Manzetti and all his relatives. The captain of the fire brigade uncovered the monument to the strains of the royal march. The monument is of bronze, representing a shield raised at the corners and supported by two boys. At the base are seen the symbols of mechanics. On the monument is the inscription: 'To Innocenzo Manzetti, who devised and executed the first telephonic apparatus in the year 1864. The Association of Mechanical Industry and Kindred Arts of Turin.'"

The Rogers Suit.—A special dispatch of July 28 from Washington says: It is understood that the defendants in the telephone suit brought by Mr. J. Harris Rogers will file their answer in a few days. Messrs. Isham G. Harris and Casey Young will file their reply in common, as well as General Joseph E. Johnston and Commissioner of Indian Affairs Atkins, while Attorney-General Garland will file his reply separately. Rogers in his bill indulged in some severe criticisms and personalities toward Senator Harris and ex-Representative Casey Young. These two will reply in a similar strain, and, according to the report, will handle the two Rogerses without gloves. Messrs. Johnston and Atkins in their reply and Attorney-General Garland in his, will keep to the line of the allegations in the bill. Mr. Garland will leave for his home in Arkansas either the last of this week or the first of next week, and his answer will be filed before his departure. It will be very elaborate, as it will reply at length to all specifications in the bill of Rogers.

THE ELECTRIC LIGHT.

Buffalo is filled with electric lights. The Brush Electric Light Company there has added over two hundred lights to its plant within the last few months.

Wichita, Kan.—The new Schuyler company has a capital stock of $50,000. Mr. J. O. Davidson is one of the incorporators. The Westinghouse Company supplies two 60 h. p. engines.

Waterbury, Conn.—The Waterbury Electric Light Company has been incorporated. Capital stock, $2,000. Edward S. Hayden, John C. Francis and L. F. Burpee, incorporators.

Increase at Detroit.—The Brush Electric Light Company of Detroit has just added to its already extensive plant Brush machines and double, or all-night, lamps for 250 additional lights.

Philadelphia, Pa.—The incorporation is announced of the Illuminating Company of Philadelphia, Pa.; capital stock, $5,000. Treasurer, Mr. Andrew J. De Camp, Secretary of the local Brush Company.

The Van Choate Electric Light Company of New England, of Portland, Me., lately incorporated, has a capital stock of $1,500,000. The President is George C. Barrett, Boston; Treasurer, Frank Q. Brown, Melrose, Mass.

Oswego, N. Y.—The Home Electric Light Company, of Oswego, N. Y., has been incorporated. Capital stock, $50,000. Incorporators: Robert G. Post, Edward P. Penfield, Sidney Van Auken, Warburton T. Henderson and James Henderson.

The Markle Engineering Company, of Detroit, Mich., has incorporated with a capital stock of $15,000. The company will make steam and electric machinery. Mr. John R. Markle, well known to electricians, is one of the incorporators.

Brush Plants in the West.—The Chicago office of the Brush Electric Company, which is now at No. 130 Washington street, reports business very active. Sales of several hundred arc lights and several thousand incandescents have been made within the last sixty days.

The Light for Factories.—The Wilcox Tanning Company has just installed a plant of 300 incandescent lights. The plant consists of compound wound Brush machines and Swan lamps. The Falcon Iron and Nail Company has also lately purchased a Brush incandescent plant of 100 lights.

Clinton, Ia., is to be lit this week by 25 Thomson-Houston arc lights. The citizens are calling for incandescent lights faster than the wires can be put in the buildings. The loca company expects to run a circuit three miles up the river to Lyons. Mr. Fred. T. Herbert is manager. Mr. E. Alexander is looking after the line construction.

Delaware.—Mr. W. S. Heger, the electrician of the Edison company at Wilmington, is installing two local industrial plants, one at the Stanton Mill of the Kiamensi Woolen Company, and one at the Marshalltown Mills of J. R. Bringhurst. The residence of Mr. Bringhurst will also be lighted by incandescent lamps throughout, and there will be a switch in the house controlling the roadway lights in front.

The American System of arc lighting is rapidly making a fine record. The American Electric Manufacturing Company reports a large amount of new business during the last few weeks. With its strong management, its Edison alliance, and its efficient apparatus, it is securing attention and contracts all over the country. We understand that the company has some highly important and beneficial steps in contemplation.

An Inharmonious Blacksmith.—David Arnold, a blacksmith at Paterson, N. J., objected last week to the erection of an electric light pole in front of his smithy, and as soon as it was up he cut it down. He was arrested and held in bail. Another pole was put up, and this Arnold cut down like the first. Then Mr. J. F. Noonan, the manager of the company, took a hand, put up another pole and said it should stay there. This time the pole was wired, and a man was left in charge at night. Then the irate blacksmith went for the man, hacked his hand and chopped down the pole as before. Mr. Noonan says a pole shall go up to stay, and his word is reliable. It will be an iron one this time. Arnold threatens to dynamite it, and is apparently fool enough to try the experiment.

APPLICATIONS OF POWER.

Des Moines, Ia.—The local Edison company has ten motors in place, and is supplying more. One of them is 5 h.-p.; the others are smaller.

Detroit, Mich.—A company has been organized to build a street railroad from the terminus of the Congress street line in Detroit, Mich., to the suburban town of Springwells. The road is to be worked by electric motors. Work on the line will be begun at once.

PERSONALS.

Mr. John C. Booth, President of the Plume & Atwood Manufacturing Company, and formerly of the firm of Holmes, Booth & Haydens, at Waterbury, Conn., died last week of pneumonia after two days' illness. He was one of the best known manufacturers in New England and probably the wealthiest man in Waterbury. He was 78 years old and leaves a widow and one daughter.

Mr. John R. Martin, agent of the Norfolk & Western Railroad, has in his possession the telegraph instrument which was in use at Appomattox Station in April, 1865. It is a very old Morse instrument, made under the first patent taken out in America. On this instrument were sent all of Gen. Grant's dispatches, both before and after the surrender of the Confederate forces.—*Farmville (Va.) Journal.*

Mr. George A. Jenks.—Bell Telephone managers and the men whom they control will not be pleased with the President's nomination, sent to the Senate to-day, of Mr. George A. Jenks to be Solicitor-General in place of Mr. Goode, rejected. In all other circles warm commendation of the selection of Mr. Jenks is heard to-night. He is regarded as ably qualified to fill the office of Solicitor-General, while he will find the knowledge of telephone matters gained while investigating the subject as Assistant Secretary of the Interior of special value in connection with the Government suit to test the validity of the Bell patent. When Mr. Jenks resigned his position in the Interior Department, it was understood that he did not desire to enter public life again, and his consent to take the Solicitor-Generalship is credited to a willingness to meet the express wishes of the President.—*New York Times.*

MISCELLANEOUS NOTES.

The Summit Electric Manufacturing Company, Akron, Ohio, recently incorporated, has a capital stock of $100,000. Mr. Jeremiah A. Long is one of the incorporators.

New York Subways.—At a meeting of the Electrical Subway Commission held on Aug. 3 specifications and reports were submitted by Engineer Kearney and Dr. Ledoux, the chemical expert. The commission authorized and directed the contracting company to begin within three weeks the construction of a subway at Twenty-third street and Sixth avenue, on the easterly side of the avenue six feet from the curb, and along the line of the avenue to Fifty-ninth street, and to prosecute the work with due diligence. The construction is to conform in all respects to the general specifications as to the execution of the trench and refilling the same, the tests to be made after the conduit is constructed, of the foundations of the conduit, the joints of the conduit, the man-holes and the distributing conduits.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2, a 3; Western Union, b 67¼, a 67⅝.

Telephone.—Am. Bell, b 207, a 207½; Erie, b 27¾, a 28; New England, b 39, a 39½; Mexican, b 1⅛, a 1⅛.

Electric Light.—Edison, b 120, a 125.

BUSINESS NOTICES.

Kidder Batteries.—"The batteries of the Jerome Kidder Manufacturing Company are taking a front rank in the various essentials of superior excellence. They can be relied upon to give entire satisfaction."—*Western Druggist.*

The National Feed Water Heater made by the National Pipe Bending Company, of New Haven, Conn., is made in seven sizes, is said to be "the lowest priced heater in the market," and is now in use in several electric light stations with excellent results. It consists of an iron shell containing coils made of the best seamless drawn brass tube, which is guaranteed to stand a pressure of 500 pounds to the square inch. The exhaust steam passes through the shell, and the water through the brass coil, and as brass is one of the best conductors of heat, the water is always kept at boiling point, even if the pumps are kept running constantly for ten or twenty-four hours a day. The simple construction of this heater is such that the exhaust steam is not confined in the least, and always has a free passage, thus obviating, entirely, any liability of back pressure on the engine. The arrangement of the coils is also such as to condense a large part of the steam and serves to relieve the engine. The use of coils, furthermore, wholly obviates any trouble from leaky joints, by reason of the contraction and expansion of the tubes, and this is a point that hundreds that have used heaters know the necessity of guarding against; the regular coil also allows a free and easy flow of the feed-water. The drip pipe at the bottom of the heater (which should always be kept open), allows the rapid discharge of the condensed steam. The exhaust steam after passing through the heater can be used for heating purposes.

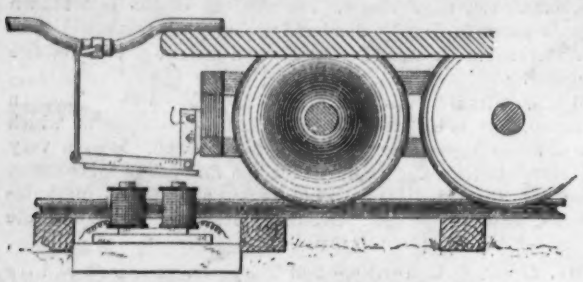
German Corn Remover
Kills corns and bunions, unfailing, rapid, painless; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure; 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals and beautifies the skin; 25c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JULY 20, 1886.

345,700. Safety Automatic Brake; Frank E. Kinsman, New York, N. Y. Consists of suitable means for automatically setting or applying the car brake, and a controlling electro-magnet, combined with a normally-closed safety-circuit which embraces the rails of the track, so that in the event of the breaking of the circuit, either designedly or accidentally, the brakes will be automatically applied. A portion of the construction is shown in the cut.

345,720. Vibrating Electric Motor; 345,721. Synchronous Movement; Albert L. Parcelle, Boston, Mass., Assignor to the National Electrical Co., New York, N. Y. 1. Consists of a vibrating bar fixed at one end, the vibrator-



345,700. SAFETY AUTOMATIC BRAKE.

magnets arranged with their poles opposite the edge of the vibrator and in a plane parallel or substantially parallel with the plane of vibration, and the circuit and circuit-connections of the vibrator or motor magnets, whereby the vibrator is continuously actuated. 2. Covers some improvements upon his patent 324,153, of Aug. 11, 1885.

345,755. Electrical Indicator; 345,756. Battery; Charles Wirt, Chicago, Ill. 1. Relates to an instrument or apparatus for measuring the electromotive force existing at any part of an electric circuit. It consists of a graduated variable resistance, and a shunt around a part of said resistance, including a standard battery, a galvanometer, and a circuit-making and breaking key. The resistance is connected between the two points whose difference of potential it is desired to measure. 2. Consists of an idle plate placed in a compartment situated intermediately between two compartments, each of which contains one of the active plates of the battery, which plate takes up the copper deposit and leaves the active zinc plate bright and unchanged.

345,762. Telephone Transmitter; Grant Brambel, Havana, N. Y., Assignor of one-half to Fred. J. Dunham, of same place. (See illustrated article.)

345,838. Apparatus for Demagnetizing Watches; Charles K. Giles and Richard E. Fenner, Chicago, Ill., said Fenner Assignor to said Giles. They employ a stationary electro-magnet with mechanism for giving the necessary revolution or revolutions in front thereof of the articles to be operated upon, and combine therewith a rheotrope and a rheostat, by the former of which the polarity of the electro-magnet is inverted with regularity, while by the latter the force of the current passing through said magnet is regulated so that it may be increased or diminished, as may be desired.

345,845. Electric Railway; John C. Henry, Kansas City, Mo. The object is to supply and control automatically an electric current passing through motors upon cars. It embraces generators and conductors in double multiple arc, consisting of a series of conductors alternating in polarity and connected in pairs to the opposite poles of the generators. It includes many other features.

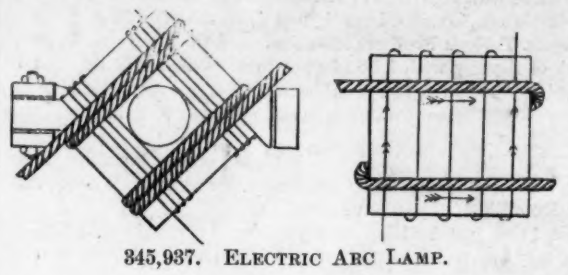
345,860. Carbonizing Carbon Filaments; Albert L. Reinmann, Pittsburgh, Pa. The crucible in which are packed the carbon forms containing the carbonizable filaments, is provided with an interior shell inverted upon a plate, the latter two elements and the forms being surrounded by carbon powder.

345,020, 345,880. Circuit Controlling Key for Incandescent Lights; Arthur G. Brown, Brooklyn, N. Y., Assignor to George Westinghouse, Jr., Pittsburgh, Pa. 1. Attached to a shaft capable of being revolved by a suitable handle or key there is a resilient arm or spring. This spring extends upon one side or the other of a stationary pin, but is capable of being sprung past the pin by turning the shaft. A loosely-mounted contact-plate is designed to be thrust in one direction or the opposite, according as this spring, when it escapes past the pin, strikes against one or the other of two projections carried thereby. The plate is thereby turned quickly upon its pivot and placed in contact with a suitable circuit-closing point. 2. The object is to provide convenient means for securing reliable electric connections between the conductor leading from the main or supply and the leading-in wire of an incandescent lamp. It consists in applying to a suitable revolving key-shaft two resilient contact-arms, the one of which is designed to be connected with a leading-in wire of the light and the other with a supply-conductor. The two arms extend toward different points in the axial line of the key-shaft, and the latter is cut away in certain portions, so that when it is desired to close the circuit one of the contact-arms is sprung backward, while the other is pressed upward into the path of the former, which is then released, and by its resilience carries an extension against the second contact-arm.

345,937. Arc Lamp; Addison G. Waterhouse, Hartford, Conn., Assignor to the Waterhouse Electric and Manufacturing Co., of same place. Relates principally to the operating magnet, which consists of a solid block, or frame, as of rods or bars properly joined together. The magnet is wound with two independent circuits arranged at an angle to each other, and they join in producing the desired magnetic effect. Two forms are illustrated.

345,956. Machine for Covering Insulated Wires with Lead; Asahel K. Eaton, Brooklyn, N. Y. Consists of a lead-chamber provided with a die or orifice, and a reciprocating plunger adapted to enter an opening communicating with the interior of the chamber.

346,031. Telephone; Julius Emner, Jr., Washington, D.



345,937. ELECTRIC ARC LAMP.

C. The diaphragm is exposed to the influence of one of the two poles of an exterior horseshoe magnet by induction, and also to the direct influence of the other pole of the horseshoe magnet, and also of both poles of an interior magnet.

346,032. Battery; Theodore Erhard, Stuttgart, Wurtemberg, Germany. Consists of a lower chamber composed of a series of electrodes and intervening partition-frames, forming cells for the exciting solution, secured together in any suitable manner, and an upper chamber provided with foraminous partitions, forming receptacles for the solution and for the salt, and also provided in its bottom with a series of connecting-tubes for engagement with the cells in the lower chamber when the two chambers are secured together.

346,053. Battery; Orazio Lugo, New York, N. Y. The negative electrode is provided with a solution of hydrochloric acid, by which the elemental matter deposited in the action of the battery is removed.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.

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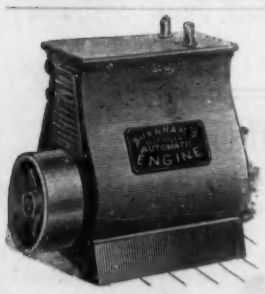

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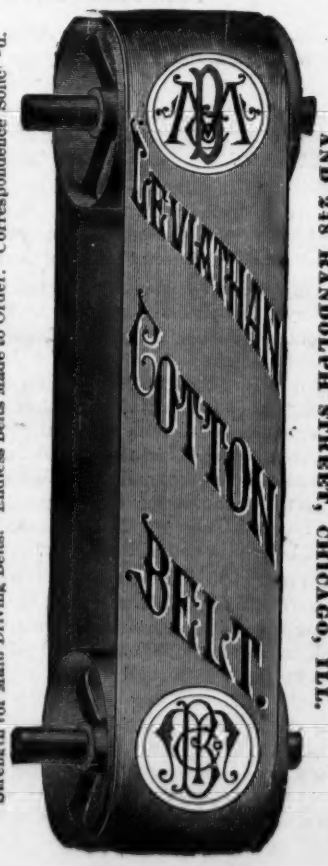

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